the Iron Age
A Chilton Publication
E NATIONAL METALWORKING WEEKLY • SEPTEMBER 30, 1954

What's New in Powder Metallurgy
See page 73

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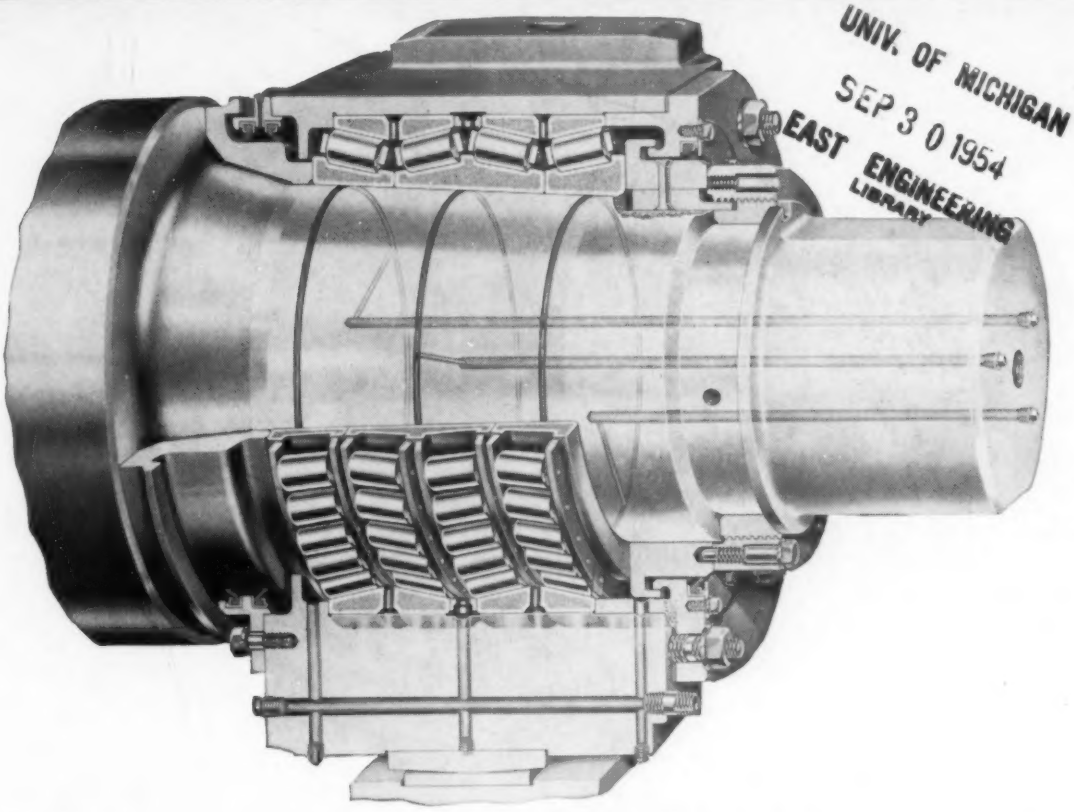

New tapered bore TIMKEN® bearing has interference fit—yet can be removed easily

THIS Timken® TQIT bearing gives you maximum capacity for high-speed roll necks. It has an interference fit, yet it can be removed quickly and easily. All you have to do is expand its cones hydraulically.

This Timken roller bearing, like other Timken roll neck bearings, gives you better steel, more uniform gage and less scrap loss. That's because there's no need to change the screw-down pressure when the mill comes to speed.

To get into production, you make the screw setting, put the load on the Timken 4-row tapered roller bearings and start the mill rolling. Adjustment is maintained while mill operates under various loads and speeds.

Timken bearings use economical grease lubrication. Complicated lubricating systems are eliminated. There's no loss of lubricant during roll changes. Rolls can be changed faster because there are no pipes or tubes. And there's less leakage of lubricant because Timken bearings keep housings and shafts concentric, making closures more effective.

There's no need for special thrust bearings because the tapered construction of Timken bearings enables them to take any combination of radial and thrust loads. And Timken bearings make possible higher mill speeds. Their true rolling motion and incredibly smooth surface practically eliminate friction. Starting resistance is reduced to a minimum. Result, no roll scuffing, no scoring of steel.

This is the world's first 4-row tapered bore bearing. And it's the greatest development in roll neck bearing design since the Timken Company pioneered the first balanced proportion bearing in 1941.

Write now for more information on how this new bearing can benefit your mill. Address The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

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TRADE-MARK REG. U. S. PAT. OFF.

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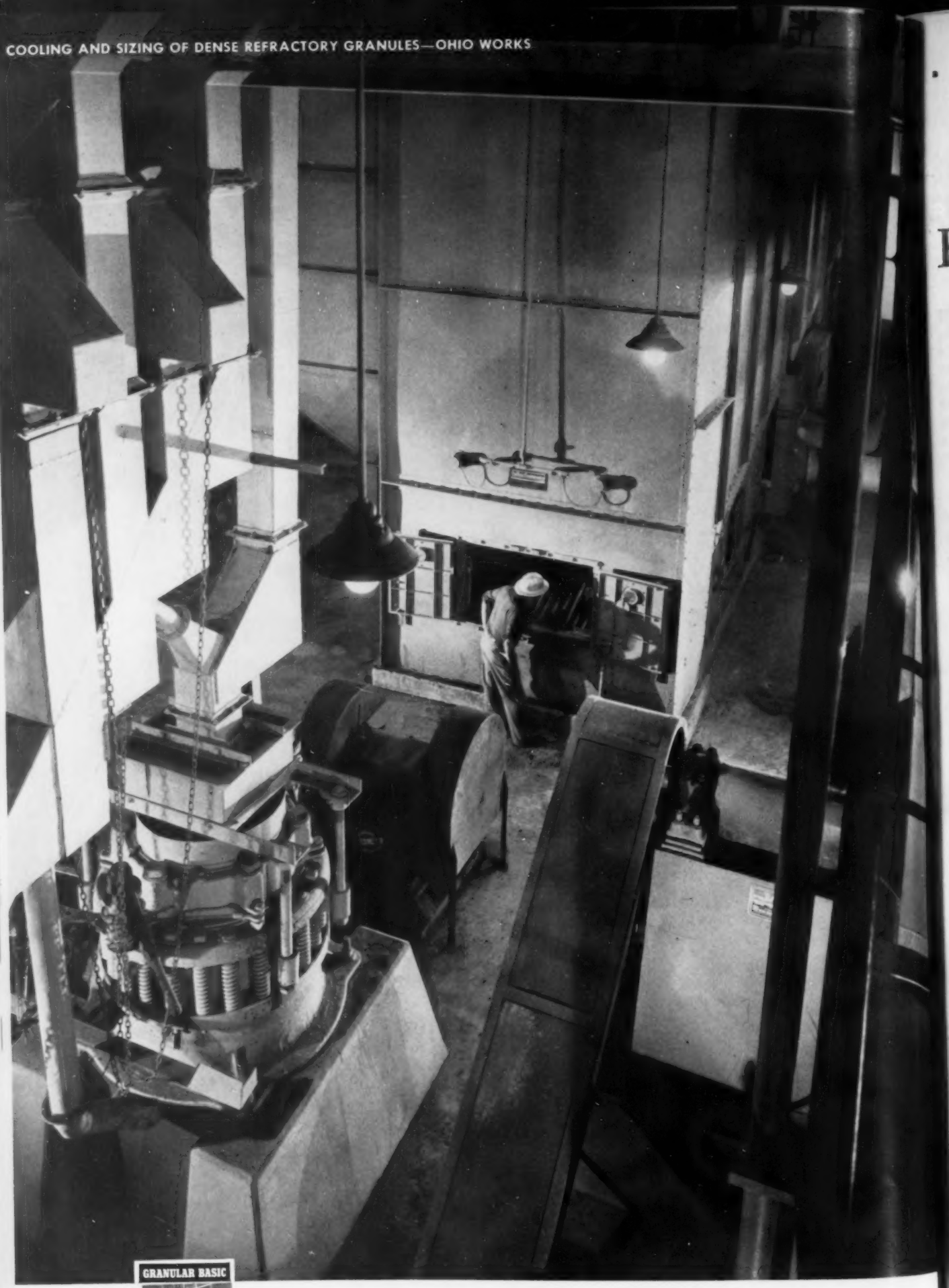
NOT JUST A BALL ○ NOT JUST A ROLLER ⊂⊃ THE TIMKEN TAPERED ROLLER ⊂⊃ BEARING TAKES RADIAL ◐ AND THRUST →◐← LOADS OR ANY COMBINATION →✳←

COOLING AND SIZING OF DENSE REFRACTORY GRANULES—OHIO WORKS



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BASIC REFRACTORIES INCORPORATED CLEVELAND 15 OHIO

He keeps his eye on the ball

Let's climb into one of the hot-mill pulpits at our Lackawanna sheet plant for a moment. Meet Buck, the speed operator at the controls to your right. He has just calculated the rolling-speed requirements for a run. He's setting up the speeds for the finishing train. From here on in, it'll be up to him to maintain proper tension on the sheet during every second while it whizzes through the mill.

"This continuous mill is as sweet a piece of machinery as you'll ever see," Buck will tell you with a prideful grin. "But you have to keep your eye on the ball, because the mill doesn't run by itself. It still takes a bunch of guys who really know their stuff to turn out good sheets.

"Here at Lackawanna we go all-out for 100 per cent quality sheets. That's another reason why it's my job to see that these mill stands keep turning at exactly the right speeds—and I mean *exactly!*"

Buck knows whereof he speaks. The speed relationships from stand to stand, and from operation to operation, have a great deal to do with determining the quality of the final product. For example, if one stand is running too fast in relation to the one that precedes it, the steel may be stretched into an hour-glass shape. Speeds must be *right* all along the line.

It takes good men to make top-quality sheets. Good men, and of course good equipment, and good steel. But in our sheet mills at Lackawanna and Sparrows Point you'll find something else, in addition: the will to produce the finest hot-rolled and cold-rolled sheets made anywhere.

That comes partly from the natural satisfaction that a man feels in doing good work, partly from healthy self-interest. For a good product means satisfied customers, and satisfied customers mean more orders to keep mills running and men at work.

Take a bunch of men imbued with that attitude, give them the best tools money can buy and the best steel we know how to make, and you'll get a good product, every time! That's why you can look to Bethlehem for sheets that, at the very least, will compare favorably with the best the industry is making. Sheets that are as finely finished, as easy forming, as true to gage, as any on the market. Sheets as fine as you can buy!

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BETHLEHEM STEEL

BETHLEHEM SHEETS

the Iron Age

Vol. 174, No. 14, September 30, 1954

DIGEST OF THE WEEK

Starred items are digested at the right

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NEWS DEVELOPMENTS

PORCELAIN ENAMEL MARKET HAS HIGH GLOSS — P. 39
Growth of the porcelain enamel industry has been big and fast: From $85 million worth of production in 1939 to $437 million in 1950, $382 million in '53. But the industry sees even better things ahead, confidently predicts 1960's business at $488 million. Research has built a substantially better product, and new uses are turning up every day. Building is a major and growing market, while industry and defense are finding new uses for porcelain enameled metals.

BLOW IN NEW MERCHANT BLAST FURNACE — P. 41
Built to supply over 200 northern Ohio and Michigan foundries, a new merchant blast furnace was blown in last week by American Steel & Wire. Capacity of the new Cleveland unit is 1350 tons daily.

WHY YOU AND YOUR BUSINESS NEED A WILL — P. 46
Financial and legal advisors know that the drawing of a will is a job many businessmen put off indefinitely —or handle in haste. Yet it may turn out to be the most important document you ever sign. This article is the second in a series of articles on financial and estate planning THE IRON AGE is presenting with the cooperation of Provident Trust Co., Philadelphia, and its vice-president, John J. Buckley.

McDONALD: RESPONSIBILITY IS KEYNOTE — P. 49
USW chief stresses shared obligations of labor, management. Both must work for healthy steel industry. He rejected "Marxism" and "bread and butter" thinking. Steelworkers will stay in CIO.

NEW FIRM SPANS INVENTOR-PRODUCER GAP — P. 51
On a fixed-fee basis, this new company helps its clients diversify by finding new products for them to make. Product Development Corp., affiliated with American Research & Development, has clicked from the start. Case histories show valuable results.

LABOR SEC'Y MITCHELL TELLS OFF UNION — P. 57
At AFL's annual convention last week Labor Secretary Mitchell accused AFL of political bias. Then he listed Administration's achievements, said more would be done if union gave credit where credit is due. His speech should quiet some of the criticism he has received from businessmen even if it doesn't improve his union standing any.

IN METALWORKING

MARKETS & PRICES

STEEL FINISHING PACES INGOT GROWTH — P. 42
Expansion of steel finishing capacity has closely paralleled growth of pig iron and ingot capacity in 1948-1954 period. Compilation by Iron Age districts shows steelmen where competition is, shows users where supplies are. Flat-rolled capacity zoomed in the 6-year period. Close correlation between pig iron, ingot and finishing capacity in districts.

NON-INTEGRATED MILLS CAUGHT IN SQUEEZE — P. 45
Strongly competitive conditions in the steel industry are putting a wage-price squeeze on non-integrated producers. One firm has already tossed in the sponge. It especially hurts flat-rolled producers. Specialty suppliers have best survival chance.

STUDEBAKER LEADS AUTO PRICE CUTTING — P. 60
Independent automakers will make some selective price reductions on '55 lines. Enabled by mergers and production economies, cuts will better market positions, aid dealers. Few will be passed on to consumers. Chrysler could set off round of Big Three price cuts.

MARKETS & PRICES

STEEL CONTINUES SLOW BUT STEADY GAINS—P. 125
The steel market continued to show fresh signs of strength this week, although nobody could call the upturn dramatic. Rather, the emphasis was on a gradual quickening of the order tempo. This trend is expected to continue, with tempo quickening as automotive orders increase. These have been only trickling in, but new model buying is a slow starter.

ORDER BOOKS SPARK OPTIMISTIC OUTLOOK — P. 126
Galvanized paces strengthening sheet market. Less stainless will be used on '55 autos. Trend is now toward plated carbon steel. Plate and structural volume holding up. Bars improve somewhat.

WEIGH STOCKPILE COPPER DIVERSION PLAN — P. 128
Government planners late last week were considering a proposed plan whereby copper would be diverted from the stockpile to ease the tight market shaping up for fourth quarter. The move would need Labor Secretary Mitchell's okay, however, as it might be construed a strike-breaking activity by unions.

FEATURE ISSUE—

POWDER METALLURGY

POWDER METALLURGY CAN LOWER YOUR COSTS—P. 74
Potential savings which powder metallurgy techniques make possible are often high. Raw material costs may be higher than those used with other fabricating methods, but beyond this over-all savings can multiply rapidly.

POWDER PRESSES KEEP UP WITH INDUSTRY — P. 76
Modern powder metal presses are producing larger, more complex parts made to exacting specifications. Presses have been designed with closer, more accurate controls to speed setup and reduce press downtime.

HOT COINING GIVES TRUE DENSITY IN PARTS — P. 80
Alloy powders, in which each particle is of the desired composition, are being used to form powder metal parts of true density by hot coining. Steels of the 4600 series were the first to be hot-coined to full density. Preliminary results with high-temperature alloys are encouraging. Parts are as good or better than cast parts of the same alloy.

BETTER RESULTS FROM SINTERING FURNACES — P. 83
Preventative and remedial maintenance of sintering equipment helps to achieve consistently high work quality in the production of powdered metal parts. Control of temperature and time in heating, and prevention of carbon or ash accumulation is important. Five different protective atmosphere gases are used for sintering.

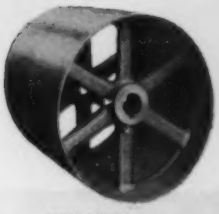
PROPER PLATING IMPROVES SURFACE FINISHES—P. 88
Plating on powder metal parts can be done satisfactorily by use of proper techniques. Selection of the plating method depends a great deal on surface porosity of the part. Some porous parts can be plated by special techniques without closing the pores.

HIGH-DENSITY PROCESSING OPENS NEW FIELDS—P. 91
Small complex powdered metal parts are being made with strength characteristics, tolerances and surface finishes equal to or better than those of steel parts. Physical characteristics of parts can be varied to suit service conditions by varying their density and method of production.

CASE HISTORIES OF POWDERED METAL PARTS — P. 94
The large volume of parts now being produced by powder metallurgy techniques is a good indication of the growing importance of this fabricating method. Here is a short description of a few of the numerous parts now being successfully produced.

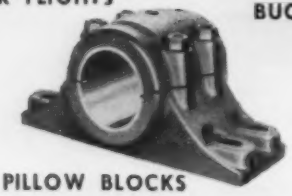
SCRAPER FLIGHTS

BUCKETS



PULLEYS

ELEVATOR BOOTS



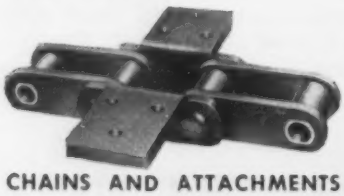
PILLOW BLOCKS

SPROCKETS

RACK AND PINION VALVES

SLATS

SLATS



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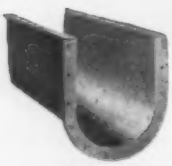
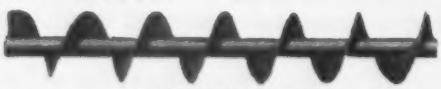


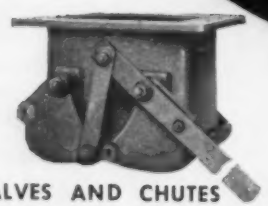
SPIRAL TROUGHS

SPIRAL FITTINGS



SPIRAL FLIGHTS

APRON FLIGHTS



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ABP NBP

Editorial:

Is The Businessman Religious?

WHEN ministers, priests or rabbis get together a sure topic for discussion is the growth in church membership. There is a happy admission that conversions, regular worship and new members are gaining phenomenally.

Inspirational literature and ethical books are also in great demand. Soul searching has become common among us. Some business firms have chapels or chaplains and others are considering both.

When the subject gets a second going over among spiritual leaders there is often an inference that church membership growth is not necessarily a sincere growth. Sometimes the old chestnut is thrown out that businessmen go to church because it's good business.

Secular essays often ascribe the growth in churchgoers or the increase in those who have become more religion conscious to the H-bomb, the cold war, insecurity or fear of communism. The real answer is probably much simpler than that.

For many years an increasingly larger group of business people have been taking an active part in the church of their choice. They have done this because they wanted to and because of an inner need. Most are not articulate in public about their religion or its effect on them. But their actions at work and in conference and their decisions affecting others show God's influence.

It is doubtful if the majority of religious-minded executives and business people ever will be vocal about religion. But at after-hour meetings, at lunch and "in the corner" talks, such people invariably disclose by their conversation and by their actions that they are deeply and sincerely religious. Chances are that more and more business and community leaders will become ardently active in church work as time goes on.

The insufficiency of mere material gains coupled with the knowledge that communism—even if held at bay by military preparedness—can only be defeated by ideas is bound to increase participation in and respect for religion in this country.

Few businessmen today belong to and participate in a religion because of commercial benefits or because they are "joiners." If you don't believe this go to your church and talk with your neighbors. They will answer if they are questioned.

Tom Campbell

EDITOR

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dear editor: *letters from readers*

TV Cabinets

Sir:

I have noted with interest the article on p. 55 of your Sept. 2 issue regarding the manufacturing by TV manufacturers of steel or metal cabinets.

I noticed that Arvin Industries, Inc. was omitted, and just for your information, we are manufacturing our own steel cabinets for our 21-in. table models. These cabinets are manufactured in our own factories. *J. M. Jewell, Advertising Manager, Arvin Industries, Inc., Columbus, Ind.*

Micromerograph

Sir:

I have read with a great deal of interest the article "Particle Size Distribution Analyzed Quickly, Accurately," by F. S. Eadie and R. E. Payne which appeared in the Sept. 2 issue, p. 99.

Would you kindly inform me where I can obtain more information on this instrument. *E. Konrad, American Platinum Works, Newark, N. J.*

Further information on the micromerograph may be obtained from the Sharples Corp., Research Laboratories, 424 W. Fourth St., Bridgeport, Pa.—Ed.

Heli-Arc Welding

Sir:

In reading your Sept. 9 issue, the following article appearing on p. 73 regarding a new type of welding wire for heli-arc welding interested me: "An improved welding wire for heli-arc and sigma welding has been developed by a west coast company. A special chemical treatment has been used to remove oxides, which are a chief cause of poor arc and poor fusion."

I would like some information from your magazine, such as, the name of the west coast company who developed this welding wire so that we may contact them requesting a representative visit us with all the pertinent information. We are very interested in getting some samples of this welding wire to see if we may be able to use it in our operations at Cadillac. *A. W. Priebe, General Foreman, Sheet Metal Div., Cadillac Motor Car Div., General Motors Corp., Detroit.*

Details on the heli-arc welding, tradenamed "Spoolalloy" may be obtained by contacting Pacific Welding Alloys Mfg. Co., 312 North Ave. 21, Los Angeles 31, Calif. —Ed.

Affects of Radiation

Sir:

I enjoyed reading Messrs. C. R. Sutton and D. O. Lesser's article on "How Radiation Affects Structural Materials," Part I, in your Aug. 19 issue, p. 128, and would like very much to have a copy. *J. R. Woodward, Physicist, Research Div., Solar Aircraft Co., San Diego.*

Standard Cost System

Sir:

I am interested in obtaining five reprints of an article entitled "Standard Cost System Pinpoints Excessive Cost Areas, Lowers Operating Expenses," by W. C. Fitts, which appeared in the Sept. 9 issue. *G. R. Leonard, Asst. Sales Manager, Dresser Mfg. Div., Dresser Industries, Inc., Bradford, Pa.*

Taconite

Sir:

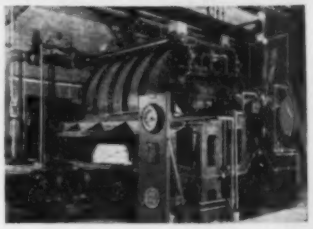
Would you please send me two reprints of the article entitled, "Taconite: Mesabi's Answer to the Iron Ore Shortage," as published in the Mar. 12, 1953 issue. I would appreciate this very much. *W. B. Todd, Peter F. Loftus Corp., Pittsburgh.*

This way you have better temperature control . . . and you save on fuel and maintenance

Cover lifter built by Lake Erie makes a big improvement in The TIMKEN Company's soaking pit operation

The soaking pit cover lifter illustrated is a new design built for The Timken Roller Bearing Company by the Lake Erie Engineering Corporation. It has many points of superiority over most other types of cover lifters. Obviously, it is a tremendous improvement over old-style covers that damage brickwork and do not provide a good seal because they have to be dragged across the top of the pit to open and close it.

The Timken Company is just one of the many nationally-known customers for LAKE ERIE'S specialized equipment and services. These companies — and industrial firms all over the world — have learned the advantages of doing business with LAKE ERIE which has one of the most competent engineering staffs and completely equipped plants in the heavy machinery field. Ask us to quote on your next requirements. LAKE ERIE'S Rolling Mill Auxiliary Equipment and Rebuild Services — famous in both ferrous and non-ferrous mills in Western New York for years — are now available throughout the United States.



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fatigue cracks

by William M. Coffey

Nonferrous Indeed

About once a month some well-meaning guy raises an eyebrow and asks an editor, "Oh, are you interested in nonferrous metals, too?" This sort of thing once led to an abortive suggestion that our 99-year old name be changed to more accurately reflect the fact that we serve the whole metalworking and metalproducing market.

Sure, we run a lot on iron and steel. But questions like that are irritating when you put out hundreds of pages of nonferrous news every year. Even in this column. Viz:

The cut below showing Miss Ann Kozel, secretary at Metalphoto Corp., was copied by our engraver from an aluminum print. There's a regular photographic negative involved, a regular copper engraving for our use. Difference is that aluminum replaces the usual photographic printing paper in the process used by this Cleveland firm.

Process uses silver salts, similar to those suspended in photographic emulsions, imbedded in the surface of anodized Type 2S aluminum.

Miss Kozel on aluminum . . .

. . . with your f. f. j.

This is handled like regular photographic printing paper.

Brains Dept.

Because we skipped a week of puzzle answers last week we have now to give out with two sets. On the Sept. 2 monkey-banana thing the consensus is 79 (#1 got 33, #2 got 24, #3 got 18 and the monkey got 4). Winners: M. M. Schaffer, J. M. Scott, Elaine Larson, A. E. Leiferman, Kathryn Scanlan, A. Palermo, Nora LaDow, Norman Holcomb, D. W. Sampson, Kenneth Hofer and M. R. Bowerman.

Farmer Brown's cow problem (Sept. 9) solves itself when he takes on his return trip 8 cows, 8 calves and one contented bull. So far these agree: T. R. Hunter, Ira Pegues, Jr., Shirley Norman, J. F. Abbott, H. H. Lee, Harry McCue, W. B. Lobbenberg, K. S. Frazier, Thor Ljunggren, Andrew Eugene, Jim Mull & Marilyn, J. M. Scott.

Bank Robber Puzzle

M. R. Bowerman admits this caused a little trouble when he submitted it 18 years ago. (We take a long time making up our mind.)

Four robbers, A, B, C & D, tie up the guard and rob a bank. They find silver dollars which they distribute as follows: They find 3 counterfeits left in the vault, after which they divide the balance into 4 equal piles of which A takes one. Then they scramble the balance and divide into 4 equal piles with 2 left over, which are given to the guard. B takes one pile; the balance is scrambled and divided 4 ways, but again 2 are left over for the guard. C takes a pile. Same thing again. This time there are 3 left of which one is counterfeit and left in vault. Guard gets the two good ones. D gets one pile. The balance is then divided into 4 equal piles, each man taking one. How many dollars did each robber get?

STRUCTURAL STEEL FABRICATORS

POLLASKY AUTOMATIC SPACERS insure huge savings in the fabrication of steel and will cut your costs of punching holes in iron. Rapid punching using only ONE OPERATOR. The spacing bars used can be rapidly set and eliminate all templet making and marking of iron. These Spacers operate on forward and return travel allowing angle iron to be punched in both legs at one handling. Simple to operate. These Spacers can be designed to operate with your present punch in any size to handle your range and length of work.

STEEL STAMPING PLANTS

Set up with a blanking press this AUTOMATIC SPACER will feed any size or length of plate. A series of blanks can be cut on the forward travel and a new series of blanks cut on the return travel. Can also be used with a shear or saw for cutting off operations. Full automatic operation. Consult us for special applications.

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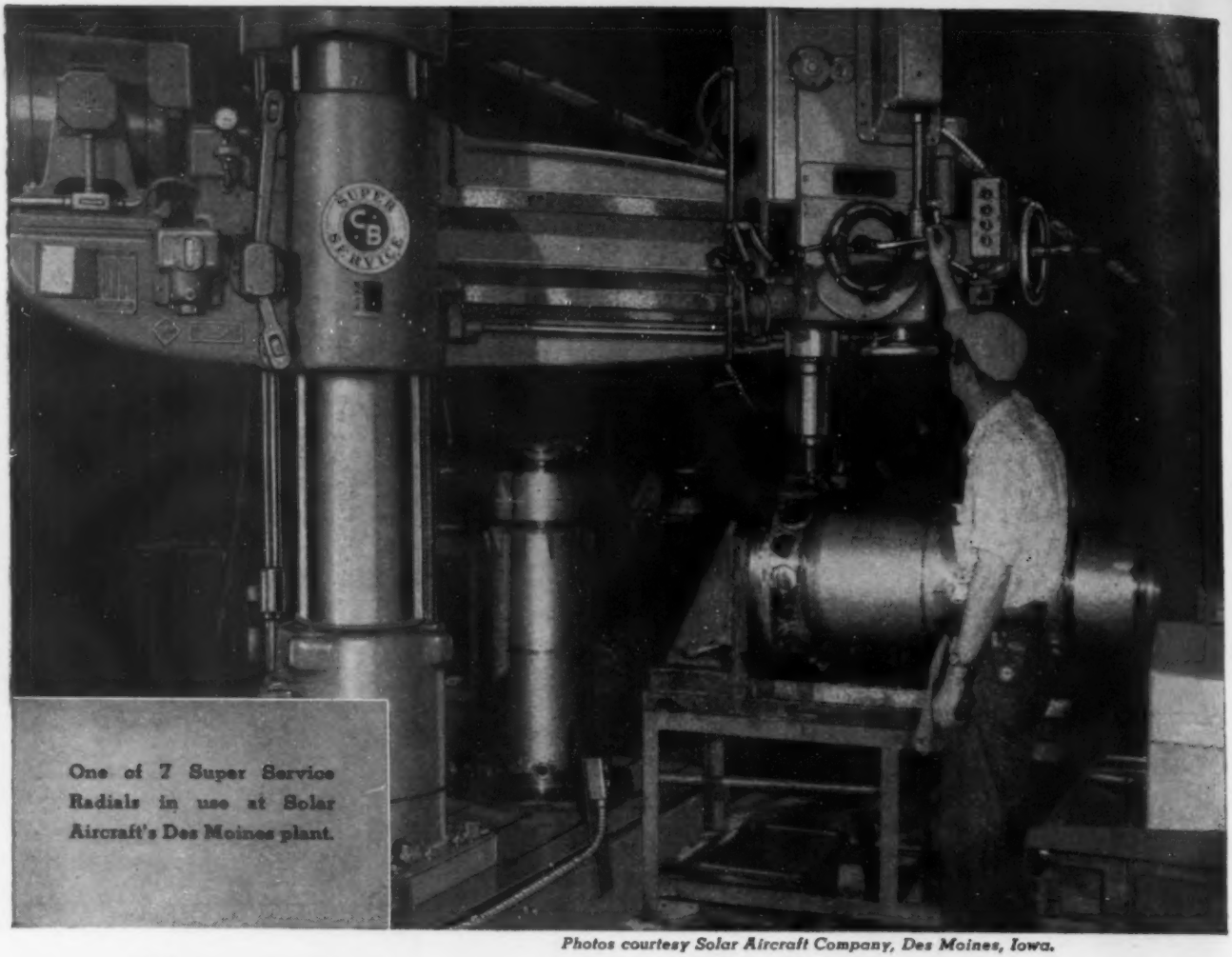
QUANTITY PRODUCTION OF GREY IRON CASTINGS

ONE OF THE NATION'S LARGEST AND MOST MODERN PRODUCTION FOUNDRIES

ESTABLISHED 1866
THE WHELAND COMPANY
CHATTANOOGA 2, TENN.



One of 7 Super Service Radials in use at Solar Aircraft's Des Moines plant.

Photos courtesy Solar Aircraft Company, Des Moines, Iowa.

"well pleased..."

"Our production people and our plant engineering department, who install and service equipment, are well pleased with our Cincinnati Bickford drilling machines."

• Solar Aircraft Company

Both large and small Cincinnati Bickford Super Service Radial Drills are used here in producing jet engine components. The arm of the machine shown above is swinging over two working positions permitting the completion of all drilling operations at both stations with a minimum of work handling. Altogether there are 10 holes drilled and reamed, 18 holes drilled and tapped, and two .656" dia. half moon radii accurately machined in this tough high-alloy steel. The accuracy, speed and trouble-free performance, the power and easy control of these machines have made them popular to both engineers and operators.

Write for Catalog R-29.

80 YEARS OF SERVICE

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

The Iron Age Newsfront

Engine Tooling Life: 10 Years

High cost of tooling for an automotive engine, which can run well over $100 million for the largest auto producers, has dictated a 10-year cycle for a new engine. One of the biggest makers plans an amortization period for its engine of 7 years, expects tooling life to last a full decade.

Steel Strapping Sales Moving Up

Steel strapping sales, once regarded by many as a fair barometer of business activity, have been moving up since August. Hopefuls see 1954 activity within 5 pct of last year's level.

Induction Heating For Welding

Use of induction heating for welding is increasing. Steel strip heated at 2500°F by the flow of high frequency current now may be pressure welded at rates exceeding 200 ft per minute. The same technique may be used for welding nonferrous materials, including aluminum, brass and stainless steel.

Room For A Small Hydraulic Press

A recent survey indicates a potential market for a portable, bench type hydraulic press equipped with foot and hand controls and having an adjustable pressure range from 200 to 2000 lb. The ram should be capable of cycling 80 to 100 times a minute over a fully adjustable stroke range. Biggest use would be for secondary operations such as assembling, forming, riveting and staking.

Ideal Aircraft Fuel Sought

Search by airlines, oil producers and engine makers for an ideal fuel for commercial jet and turboprop engines is reported making progress. When the airlines can come up with a specification for a fuel which is cheap, efficient, relatively safe and generally available throughout the world, they'll be able to ask engine makers for a model which will not need the high grade, costly fuels presently required.

Dials and Diagrams on Aluminum Foil

Possibilities of printing on aluminum foil by photographic process are being investigated by a Cleveland company which now offers sensitized aluminum plates for photographic reproduction of aircraft dials, wiring diagrams, etc. Success on 0.005-in. thick foil would also offer interesting possibilities in packaging industry where a design is required or imprinting is normally used.

Six-Spindle Turret Drill Planned

A West Coast machine tool manufacturer has on the drawing boards a small six-spindle turret drill, ¼ in. capacity, a complete unit. Plans call for the unit to be sold by supply houses.

Inning for Stainless Coming Up

Competition between stainless steel and aluminum for shares in the building wall construction market continues razor keen. Recent reports from architects and contractors indicate an inning for stainless is coming up. Several major buildings now in the planning stage will use this material for exterior walls. Stainless was specified for one building because of its resistance to corrosive atmosphere.

Heating Efficiency Improved

A radiant flame brazing technique is speeding the production and increasing efficiency of automatic type cooking utensils such as coffeemakers, deepfriers and warmers. Aluminum covered heating elements are brazed directly to the utensil. A 400 pct increase in heating efficiency is said to result from use of elements brazed in this manner.

Signal Corps Needs 2 Million Tubes

Electronic vacuum tube production for the military is an ever-thriving business. Army Signal Corps alone will buy an estimated 2 million tubes in this fiscal year. Included will be more than 200 separate types.

on Allegheny Metal Plates

For certified data on individual grades of Stainless Steel, use

ALLEGHENY LUDLUM BLUE SHEETS

There is a Blue Sheet for each individual grade of Allegheny Metal, giving full information on its physical and chemical properties and characteristics. Let us send you this certified, laboratory-proved data on the stainless grades in which you are interested.

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For any job which involves the handling of large volumes, heat and high pressures—either singly or all at one time—Allegheny Metal solid or clad plates are produced in the exact stainless grade required to combat corrosion, oxidation and contamination of the product.

Some of these grades are *new* . . . comparatively recent developments of our research and experience as a pioneer and leader in stainless steel production. Others are improved versions of older analyses. The latest information on the entire subject of stainless plates is available to you in the booklet illustrated above—32 pages of valuable data on types, sizes, finishes, fabricating methods and uses, including ASTM and ASME boiler codes.

Specify "Allegheny Metal" for complete reliability in stainless steel plates, and write for your copy of the A-L Plate Book. ● *Address Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pennsylvania.*

You can make it **BETTER** with

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WAD 4277

TIME-TESTED STAINLESS STEEL

NEWS SECTION

Special Report

PORCELAIN ENAM L: Market Sheen High

Industry growth big, fast . . . See still better things ahead . . . Research betters product, boosts sales . . . Building major market . . . Fights heat, corrosion, abrasion for industry—By G. G. Carr.

◆ REMEMBER the man who mounted his horse and galloped off in all directions at once?

That would be a good description of the porcelain enamel industry today, with the important exception that enamelers, unlike Mr. Leacock's horseman, know where they're going.

Porcelain enamel came out of the bathroom and kitchen some time ago, although these remain important applications. You can't quite say that present uses run from a to z, but they do range from aircraft to warehouses. And the industry sees no reason for them to stop there.

Never before have the basic qualities of porcelain enamel—heat resistance, corrosion resistance, and abrasion resistance—been so much in demand. But those alone wouldn't have been enough to carry porcelain enamel so far along the competitive road.

You remember the old-time enamelware. There were two colors, black and white. And it usually wasn't too long before the black ground coat was exposed as the white overcoat chipped off. It didn't take much for the glaze to craze until it looked like the windshield of a high school boy's jalopy.

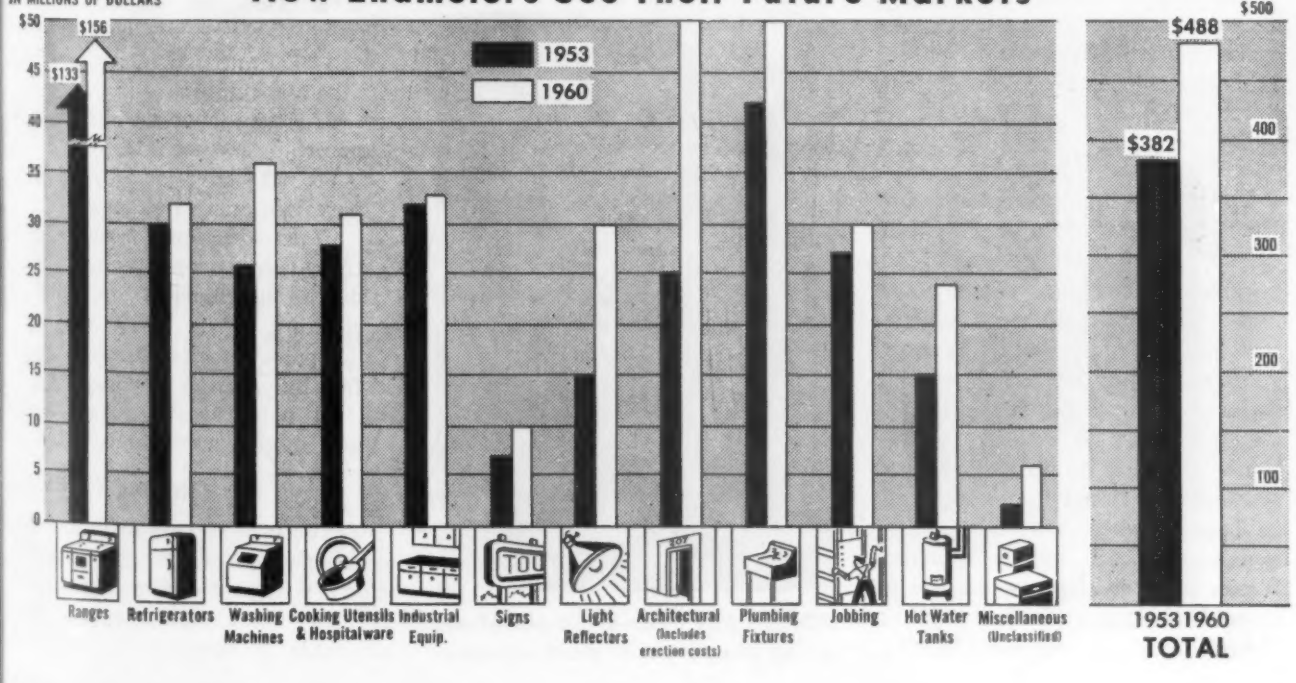
But intensive research has yielded new frit compounds and improved enameling methods. Today's product will stand up to the severe thermal and mechanical shocks of jet engine interiors. Color range is wide enough to please the fussiest designers and decorators. High gloss of earlier days can now be so toned down that elementary school classrooms are equipped with eyesaving soft green porcelain enamel chalkboards.

Building Use Grows

Rise in dollar value of its products highlights the industry's growth. In 1930 production totaled $85 million; in 1940, $171 million. Thereafter the rise has been dramatic: $437 million in 1950, $382 million in 1953. Porcelain Enamel Institute estimates the figure will hit $488 million by 1960. And this may be conservative.

Part of this increase of course is explained by the overall growth of manufacturing. Electric kitchen ranges, for example, are an im-

How Enamelers See Their Future Markets



SPECIAL REPORT

How Industry Uses Porcelain Enamel

INDUSTRIAL

- Fractionating tower bubble caps and risers
- Power transformer cases
- Latex strainers used in the manufacture of synthetic rubber
- Coal chutes
- Conveyor buckets
- Brewery storage tanks
- Pressure vessels for dye making
- Bread baking ovens
- Bus stanchions and grab hooks
- Corrosion resistant pump housing and bearings
- Pipe used in aluminum de-gassing operation
- Gypsum conveyor screw blades
- Cyclone-type dust collectors for corrosive chemicals
- Laboratory distillation units
- Laboratory autoclaves
- Open jacketed evaporating pans
- Line valves and safety valves
- Heat exchangers
- Suction filters for pharmaceuticals
- Tank linings and agitators for acid
- Cooking retorts for baby food
- Pressure reactors used in the manufacture of such pharmaceuticals as phenol-barbitol, benzocaine, terpine hydrate, and para-amino benzoric acids
- Milk storage tanks

COMMERCIAL

- Grocery and meat display cases
- Plumbing fixtures
- Wainscoting and wall linings
- Exterior and interior curtain walls
- Refrigerator linings
- Food preparation and handling equipment such as: Scales, stoves or ranges, sinks, drainboards, steam table pans.

portant application of porcelain enamel. And range output has risen from 225,000 in 1929 to 1,143,000 in 1953.

But new applications are a major part of the enameling industry's growth. Most talked about are architectural uses. Porcelain enamel as a building material has come a long way from its early filling-station store-front stage. Buildings recently built or remodeled with architectural porcelain enamel range from college dormitories to offices, plants.

Architects Have Freedom

The soon-to-be-opened Statler Hotel in Hartford is sheathed in 21,000 sq ft of greenish-blue porcelain enameled steel. Alcoa's home office building in Pittsburgh has hundreds of square feet of enameled aluminum panels on the walls of the open top floor terrace. And buildings as diverse as the Bank of America in San Francisco, the National Guard Armory in Independence, Mo., and storehouses at U. S. Steel's Fairless Works are sheathed in porcelain enameled metals.

Architects are confident of the growth of metal curtain wall construction. Enamelers point out that their process is made to order as a method of providing permanent, maintenance-free protection to metal. Available in any color and surface finishes ranging from high gloss to dull matte, the coatings give the architect new freedom in design.

PORCELAIN enamel panels afford unusual treatment of plant entrance.

Color and finish variety is giving porcelain enamel new popularity as an interior material, too. But opinion is divided on the future of porcelain enamel as a material for residental construction other than such functional uses as bathrooms and kitchens.

There is some feeling that the very factors which help enameled metals in industrial and commercial building may work against it in housing applications. Permanance of color and finish may frighten the housewife who likes to redecorate occasionally. And most of us are far more tradition minded about our homes than our plants and offices.

Proponents of porcelain enamel homes stress the flexibility and variety now possible, the ease of maintenance, and the expected cost savings as the application develops. Enthusiasts temper their predictions, however, by emphasizing that considerable consumer education is necessary to gain acceptance. It is for example perfectly possible and practical to paint over porcelain enamel—but few homeowners realize it.

Owners Are Happy

At this point someone is sure to raise the ghost of Lustron. Lustron Corp.'s financial, managerial and political misadventures were unhappily very real. But the product itself is a very different story.

New York ad agency Batten, Barton, Durstine & Osborn surveyed 200 owners of Lustron homes. Of the 200 replies,

97.5 pct—have no objection to porcelain enamel interior,

98 pct—have no objection to porcelain enamel exterior,

97 pct—have preference of Lustron home over previous home due to low upkeep and ease of cleaning,

2 pct—had altered interior surface by painting or papering,

94 pct—reported they would buy another steel home.

Resists Radiation

That's pretty good evidence that consumer preference and satisfaction is possible for porcelain enamel. But they won't come overnight. Considerable investment for research

and facilities is needed, and there are still bugs to be worked out.

Additional impetus to the architectural use of porcelain enamel comes from a grimmer quarter. In experiments at Oak Ridge, porcelain enamel was rated second only to plate glass and superior to stainless steel and plastics in radiation contamination susceptibility and ease of decontamination. This gives the material a decided edge on other building materials wherever radioactivity is feared due to possible enemy atomic attack.

Not so eyecatching as architectural applications, industrial and manufacturing uses of porcelain enamel may yet prove to be the most significant. The coatings' resistance to heat, corrosion and abrasion have made them a standout for a variety of products, ranging from hot water tank linings to jet engine components.

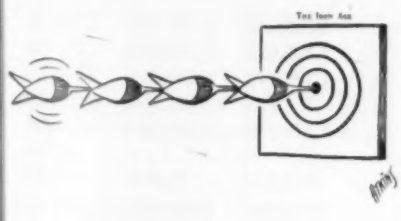
Hunt Uses, Customers

These uses accounted for over $32 million worth of porcelain enameled metal in 1953, against $12 million in 1940. Enamelers are cautious about predicting future gains, but are confident that their product will hold its present place as an important engineering material in industry.

Meanwhile the industry is carrying on an intensive research and promotional campaign. Object is not only to develop new uses but to consolidate existing markets, in some cases to recapture ground lost to competing materials.

Only one major make of refrigerator, for example, is now made of porcelain enameled steel inside and out. The industry is training its sights on this market, also reports that more manufacturers are returning to porcelain enamel for components such as meat keepers and vegetable crispers after trying plastics.

All in all, enamelers are happy about the future, see steady growth in demand for their product.



EXPANSION

IRON: Blow In New Furnace

American Steel & Wire starts new Cleveland merchant blast furnace . . . Capacity is 1350 tons per day . . . 1.74 acre plot took careful planning—*By T. M. Rohan.*

◆ IT WAS a shoehorn fit to get it in but American Steel & Wire Div. of U. S. Steel last week blew in its new 1350-ton-per-day merchant pig iron furnace at Cleveland, largest of its type in the world. Built to supply over 200 northern Ohio and Michigan foundries, including a hot metal customer, as well as a new Ford foundry in the city, the new unit is reputed to have cost over $10 million.

The new merchant iron furnace almost doubles capacity from previous 530,000 tons. Plant is the only exclusively merchant iron facility in northern Ohio and now totals over 1 million tons annual capacity. Availability of the new furnace will also permit relining and other maintenance work on the two existing units.

Close Fit

Fitting the furnace into the small available space formerly occupied by a long dismantled furnace was termed "one of the tightest fits ever made for any furnace" by a representative of Arthur G. McKee Co., Cleveland, builders of the unit.

Installation of the 1350-ton-per-day facility in the 1.74 acres occupied by an old 290-ton-per-day unit is itself a story in efficient space utilization. Erection involved putting up many Rube Goldberg supports for existing steam and gas pipes, then snaking equipment through the supports without service disruption.

In one instance an overhead triangle of beams was constructed, and pipes attached to the underside. One girder was also attached in a sky hook type arrangement. Since only one access was available (made possible by erecting a temporary wood trestle around the stockhouse to serve other furnaces) components were moved in in order of distance from entry point.

Stoves were put in at right angles rather than parallel and all raw materials must be stored elsewhere on the property.

Furnace itself is designed to handle a wide variety of analyses for such a large unit. Its high capacity is due principally to the long (106 ft) distance from iron notch to furnace top platform and a 26 ft diam hearth. Although 29-ft hearths have been used on basic iron furnaces, this is widest on a merchant iron type.

A steam cylinder bell operating mechanism is a return to earlier blast furnace design rather than air cylinders in the hoist house. The steam cylinders open the top against the furnace pressure and eliminate gadgetry on the top furnace platform. Air to the furnace is being supplied by an Elliott Co. turbo-blower rated 110,000 cfm.

BESIDE bleeder valve atop American Steel & Wire's new blast furnace are John E. Allen, general superintendent, left, and Floyd A. Garman, chief engineer.

EXPANSION

STEEL: Chart Finishing Mill Growth

Iron Age compilation shows steel finishing facilities expansion matches pig, ingot capacity growth . . . Flat-rolled gains most since '48 . . . C-R sheet up 94 pct . . . List new facilities by Iron Age districts.

◆ EXPANSION of steel finishing capacity has closely paced the huge expansions of pig iron and ingot capacity from 1948 to 1954. An IRON AGE compilation of steel industry data for the 6-year period shows these capacity gains: Pig iron, 23 pct; ingots, 32 pct; and hot-rolling capacity, 30 pct.

Actual ability to produce finished steel items is not always the same as rated capacity. Real finishing capacity may vary according to circumstances—even though finishing facilities remain the same. That's due to influence of factors such as relative demand for various products, amount of ingots available, and government or company decision as to how much of available ingots should be channeled into each product.

Basis of the compilation is the 1954 *Directory of Iron and Steel Works* published by American Iron and Steel Institute.

Most marked growth was in flat-rolled capacity. Hot- and cold-rolled sheets zoomed 66 pct and 94 pct, respectively, while hot- and cold-rolled strip increased 42 pct and 24 pct respectively. Capacity for coils for tinplate and blackplate rose 63 pct. More than making up for the 26 pct drop in hot-dip tin and terneplate capacity is the 105 pct increase in electrolytic tinplate.

With the exception of declining capacity in lapweld pipe, tubular products all showed gains. Leader was electric weld with a 170 pct increase to displace seamless as the tonnage leader.

Most spectacular percentage gain was scored by light structurals, a relatively small tonnage item, which soared 500 pct. Heavy structurals gained only 6 pct.

An extremely valuable feature of the compilation is that it also shows finished steel capacity by IRON AGE districts. This should prove useful to both steel producers and steel consumers. If you're a producer considering further expansion, you can see where the competition is located. If you're a manufacturer considering a new plant, you can determine where your steel needs will best be filled.

Steel Industry Finishing Capacity Changes, 1948-1954

(Net Tons)

Hot-Rolled Capacity Changes

	1948	1951	1954
Blast Furnace	67,438,930	72,553,460	82,001,390
Steel Ingots	94,233,460	104,502,680	124,330,410
Hot-Rolled Capacity			
Structurals, Heavy	5,236,930	5,855,150	5,565,270
Structurals, Light	1,058,470	912,360	635,625
Piling, Rolled	247,400	282,300	249,400
Plates	7,865,700	8,260,580	8,646,285
Hot-Rolled Sheets	18,947,570	24,890,230	31,504,045
Coils for Blackplate and Tinplate	4,114,300	4,694,530	6,701,900
Hot-Rolled Strip	3,635,890	4,907,550	5,177,560
Hot-Rolled Bars	12,150,560	11,977,810	14,176,150
Reinforcing Bars	1,512,800	1,658,060	1,958,480
Rails, Std.	2,705,600	2,383,600	2,007,000
Rails, Light	292,800	323,400	112,000
Splice, Tinplate Bars	1,154,000	912,770	812,510
Wheels, Axles, Rolled	404,050	446,350	456,700
Wire Rods	6,195,170	6,360,350	7,001,375
Skelp	4,405,900	5,266,700	5,630,900
Tube Rounds, Blanks	3,285,040	3,938,100	4,945,100
Forging Blooms, Billets	806,590	677,790	700,660
All Other Hot-Rolled	305,960	304,760	360,280
Total H-R Capacity	74,324,730	84,052,390	96,641,240

Other Finishing Capacity Changes

	1948	1951	1954
Cold-Rolled Sheets	8,758,845	11,498,330	16,988,680
Galvanized Sheets	2,791,620	3,183,460	3,311,620
Long Ternes	227,700	274,100	288,600
Hot-Dipped Tin & Terne Plate	3,714,150	3,200,770	2,748,680
Electrolytic Tinplate	2,176,100	3,252,570	4,475,050
Cold-Rolled Strip	2,654,940	2,825,840	3,303,280
Galvanized Strip	386,550	366,810	436,730
Pipe & Tubing:			
Buttweld	2,502,320	2,869,570	3,387,100
Lapweld	669,200	447,000	618,000
Seamless	3,462,800	3,960,900	4,648,130
Electric Weld	2,025,400	5,127,700	5,487,040
Spiral Weld	114,000	153,000	171,000
Gas Weld	5,000	18,000	33,500
Wire Products:			
Plain Wire	5,805,340	6,129,370	6,781,680
Galvanized Wire	1,802,070	1,787,110	1,778,810
Nails, Staples	1,179,140	1,200,330	1,235,950
Barbed Wire	561,875	532,955	537,855
Woven Fence	1,071,130	965,980	974,260
Reinf. Fabric			557,140
Bale Ties	162,880	173,340	238,500
C-f Bars	3,217,260	2,968,395	3,761,730

1954 Finished Steel Capacity By IRON AGE Districts

	Chicago		Pittsburgh		Philadelphia		Youngstown		Western		Detroit		Cleveland		Buffalo		Southern		South Ohio River		Wheeling		St. Louis		Eastern		Total U. S.
	Tons	Pct of U.S.	Tons	Pct of U.S.	Tons	Pct of U.S.	Tons	Pct of U.S.	Tons	Pct of U.S.	Tons	Pct of U.S.	Tons	Pct of U.S.	Tons	Pct of U.S.	Tons	Pct of U.S.	Tons	Pct of U.S.	Tons	Pct of U.S.	Tons	Pct of U.S.	Tons	Pct of U.S.	Tons
Pig Iron	15,921,250	19.4	16,419,200	20.0	9,864,000	12.0	8,017,570	9.8	4,624,260	5.6	3,351,180	4.1	5,363,500	6.5	5,335,750	6.5	5,472,080	6.7	2,791,700	3.4	3,936,800	4.8	450,000	0.5	454,100	0.6	82,001,390
Steel Ingots	24,586,700	19.8	23,015,780	18.5	16,386,450	13.2	13,895,780	11.2	8,883,290	7.1	6,550,780	5.3	6,241,000	5.0	6,452,100	5.2	5,059,520	4.1	4,875,420	3.9	4,866,080	3.9	2,785,000	2.2	732,510	0.6	124,330,410
Hot-Rolled Products:																											
Structurals, Heavy	1,272,000	22.9	1,181,000	21.2	1,705,000	30.6	6,000	0.1	518,470	9.3					552,000	9.9	130,800	2.4			200,000	3.6					5,565,270
Structurals, Light	100,200	15.8	74,000	11.6	132,000	20.8	12,000	1.9	104,445	16.4					24,000	3.8	70,200	11.0	15,000	2.4			99,500	15.7	4,280	0.7	635,625
Piling, Rolled	43,400	17.4	66,000	26.5	68,000	27.3									72,000	28.9											249,400
Plate	1,782,850	20.6	2,113,005	24.4	2,057,200	23.8	211,600	2.5	1,226,030	14.2			204,000	2.4	60,400	0.7	488,200	5.6	120,000	1.4	252,000	2.9	132,000	1.5			8,646,285
Hot-Rolled Sheet	5,797,350	18.4	3,979,795	12.6	3,372,600	10.7	2,604,900	8.3	610,600	1.9	4,251,000	13.5	2,440,000	7.7	2,165,000	6.9	646,800	2.1	2,316,000	7.4	2,636,000	8.4	684,000	2.2			31,504,045
Coils for Blackplate & Tinplate	1,705,200	25.4	1,267,000	18.9	1,586,500	23.7	300,000	4.5	564,000	8.4							739,200	11.0			432,000	6.4	108,000	1.6			6,701,900
Hot-Rolled Strip	855,300	16.5	530,000	10.2	252,000	4.9	1,641,900	31.7	72,380	1.4	375,000	7.2	126,760	2.5	600		154,300	3.0	900,000	17.4			78,000	1.5	191,320	3.7	5,177,560
Hot-Rolled Bars	3,864,350	25.8	2,723,840	19.2	778,000	5.5	2,689,200	19.0	676,340	4.8	404,000	2.8	604,000	4.3	1,570,200	11.1	407,300	2.9	301,920	2.1			213,000	1.5	144,000	1.0	14,176,150
Reinforcing Bars	178,000	9.1	136,800	7.0	254,500	13.0	62,600	3.2	706,780	36.1					115,000	5.9	209,800	10.7	72,000	3.7			223,000	11.4			1,958,480
Standard Rails	623,000	31.0	195,000	9.7	360,000	17.9			380,000	18.9					156,000	7.8	293,000	14.6									2,007,000
Light Rails			36,000	32.1	57,000	50.9			5,000	4.5							9,000	8.0	5,000	4.5							112,000
Splice & Tieplate Bars	200,200	24.6	26,200	3.2	139,000	17.1			206,210	25.4					39,000	4.8	184,900	22.8	5,000	0.6					12,000	1.5	812,510
Wheels, Axles, Rolled	70,800	15.5	325,900	71.4	60,000	13.1																					456,700
Wire Rod	1,842,270	26.3	1,630,520	23.3	677,800	9.7	108,000	1.5	508,110	7.3			394,380	5.6	209,700	3.0	463,800	6.6	200,000	2.9			635,000	9.1	331,795	4.7	7,001,375
Skelp	334,000	5.9	443,000	7.9	822,000	14.6	1,933,400	34.3	841,000	14.9			497,500	8.8			200,000	3.6			483,000	8.6	77,000	1.4			5,630,900
Tube Rounds	235,000	4.8	2,439,900	49.3			870,000	17.6	200,000	4.0			1,200,200	24.3													4,945,100
Forging Blooms & Billets	80,000	11.4	36,000	5.1	404,500	57.8			16,800	2.4					25,900	3.7					136,060	19 4			1,380	0.2	700,660
All Other Hot-Rolled	59,500	16.7	144,260	40.0	84,000	23.3			48,000	13.2					3,900	1.1			20,600	5.8							360,260
Total Hot-Rolled	18,843,429	19.5	17,348,240	18.0	12,810,100	13.3	10,439,600	10.8	6,683,165	6.9	5,030,000	5.2	5,466,840	5.7	4,993,700	5.2	3,997,300	4.1	3,955,520	4.1	4,139,080	4 3	2,249,500	2.3	684,775	0.7	96,641,240
Further Finishing Capacity																											
Cold-Rolled Sheets	2,819,700	14.8	1,959,800	11.5	1,320,400	7.8	914,000	5.4	324,540	1.9	3,027,240	17.8	1,684,000	9.9	1,500,000	8.8	397,000	2.3	1,760,000	10.4	1,330,000	7.8	252,000	1.5			16,988,680
Galvanized Sheets	509,600	15.4	338,400	10.2	288,000	8.7	453,600	13.7	178,420	5.4			60,000	1.8			269,600	8.2	446,000	13.5	624,000	18.8	144,000	4.3			3,311,620
Long Ternes	56,300	19.5					61,100	21.1											60,000	20.8	111,200	38.6					288,600
Hot-Dip Tin & Terneplate	660,000	24.0	411,900	15.0	429,300	15.6	120,000	4.4	242,780	8.8							399,100	14.5			485,600	17.7					2,748,680
Electrolytic Tinplate	963,000	21.5	777,000	17.4	958,400	21.4	180,000	4.0	381,650	8.5							278,000	6.2			859,000	19.2	78,000	1.7			4,475,050
Cold-Rolled Strip	472,640	14.3	556,700	16.9	274,030	8.3	602,000	18.2	115,260	3.5	153,000	4.6	224,560	6.8	36,500	1.1					325,000	9.8			543,590	16.5	3,303,080
Galvanized Strip	124,000	28.4			10,000	2.3	127,200	29.1					22,530	5.2			13,000	3.0			140,000	32.1					436,730
Pipe & Tubing:																											
Buttweld	348,000	10.3	594,000	17.5	803,500	23.7	578,000	17.1	138,100	4.1	2,500	0.1	503,000	14.9							360,000	10.6	60,000	1.8			3,387,100
Lapweld			270,000	43.7	348,000	56.3																					618,000
Seamless	523,830	11.3	2,211,700	47.8	3,500	0.1	729,000	15.7	192,500	4.1	26,000	0.6	929,600	20.0											31,800	0.7	4,648,130
Electric Weld	881,640	16.1	204,650	3.7	73,000	1.3	1,024,450	18.7	2,577,400	47.0	191,300	3.5	129,000	2.4			185,000	3.4	95,000	1.7			56,000	1.0	69,600	1.3	5,487,040
Spiral Weld	24,000	14.0	36,000	21.1					36,000	21.1									75,000	43.9							171,000
Gas Weld											27,500	82.1											5,000	14.9	1,000	3.0	33,500
Wire & Wire Products:																											
Plain Wire	1,636,990	24.1	1,488,120	21.9	522,700	7.7	99,000	1.4	442,350	6.5	67,000	1.0	476,850	7.0	153,280	2.3	494,800	7.3	135,000	2.0			735,400	10.9	530,190	7.8	6,781,680
Galvanized Wire	500,100	28.1	399,570	22.5	114,000	6.4	15,000	0.8	137,240	7.7	1,000	0.1	34,740	2.0	6,500	0.4	204,700	11.5	30,000	1.7			259,200	14.6	76,760	4.3	1,778,810
Nails & Staples	365,080	29.5	288,690	23.4	69,900	5.7			138,900	11.2			18,000	1.5			221,700	18.0			14,400	1.1	87,900	7.1	31,380	2.5	1,235,950
Barbed Wire	184,630	34.4	133,835	24.9	12,000	2.2			50,990	9.5							75,400	13.9					80,800	15.1			537,855
Woven Fence	297,560	30.6	227,140	23.3					34,160	3.5					3,700	0.4	118,600	12.2					287,100	29.5	6,000	0.6	974,260
Reinforcing Fabric	162,250	29.1	96,340	17.2					75,900	13.6					65,000	11.7	10,850	2.0	40,000	7.2			82,000	14.7	24,800	4.5	557,140
Bale Ties	109,730	46.1	3,760	1.6	12,000	5.0			6,110	2.5							89,200	37.3					17,700	7.5			238,500
Cold-finished Bars	996,000	25.4	1,125,560	29.9	167,700	4.5	495,340	13.2	75,600	2.0	302,000	8.0	133,530	3.6	188,600	5.0							1,200		316,200	8.4	3,761,730
Other Track Accessories	381,050	29.4	105,000	8.1	152,000	11.7	34,400	2.6	309,870	23.9					36,000	2.8	243,100	18.8	3,000	0.2	6,000	0.5	24,000	1.9			1,294,420

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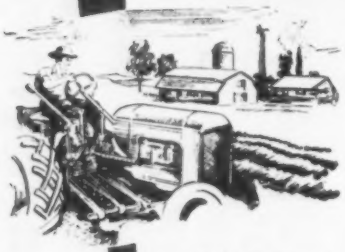

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Iron:

McLouth adds blast furnace in integration program.

Detroit steelmaking gained its second integrated steel mill last week when McLouth Steel Corp. charged its new blast furnace for the first time.

The giant furnace, which will have an annual capacity of 1,200,000 tons, is a principal factor in the company's $105 million integration program that will more than double the mill's rated capacity of 579,700 tons. Still to be completed are oxygen inverters and incidental operations such as waste purifying measures.

Expansion included new electric furnaces, largest in the industry, and additional processing and finishing facilities. A cold-rolling mill is also under construction at a site south of the Trenton, Mich., mill at Gibraltar.

Model for Industry

Until the oxygen inverters are in operation, hot metal will be charged directly to the electric furnaces. The new expansion did not include ovens to produce coke, which will be purchased from outside sources. Since the construction of ore docks in midsummer, ore and limestone carriers have been unloading at accelerated speed to assure a sufficient supply before navigation closes, a goal that is now well in sight.

Also included in the new facilities is a $1 million smoke control program that will fully dispose of the effluent from both electric furnaces and oxygen units, a process that is expected to be a model for the industry.

Dedication ceremonies, attended by about 50 Detroit area industrialists and financiers, was somewhat subdued because of the recent death of Donald B. McLouth, founder and president of the company, who died before he could see integration of the mill completed. M. A. Cudlip, acting president and treasurer, pulled the switch starting the first skip hoist of ore to charge the furnace.

STEEL: Squeeze Non-Integrated Firms

Strong competition cuts profit margins for non-integrated producers . . . Caught in wage-price squeeze . . . Overall growth of flat-rolled capacity hurts . . . But some will survive—By *J. B. Delaney.*

♦ THESE ARE trying times for the nation's non-integrated steel producers.

Strongly competitive conditions within the industry generally have created a set of circumstances that have already forced one prominent company to toss in the sponge, have slimmed profit margins of others.

Feel Flat-Rolled Growth

Current letdown has revived speculation as to whether these producers can exist in a prolonged period of stiff competition. But while the situation may be difficult, It's too early to say what will happen.

These companies have managed to survive conditions just as bad, even worse than at present. American Iron and Steel Institute lists 160 non-integrated companies, including producers of ferroalloys with no blast furnaces or steelmaking furnaces. Capitalization ranges from $15,564 for Madison Wire Co., Inc., Buffalo, N. Y., to $19.9 million for Acme Steel Co., Chicago.

Mills that concentrate on flat-rolled products probably are feeling the pinch more than others due to heavy postwar expansion of sheet and strip capacity. Two flat-rolled producers said their sales were off 40 and 60 pct from last year.

Can't Compete

Most notable recent victim of the decline is Follansbee Steel Corp., which proposes to sell its assets, including plants and machinery, for approximately $9 million to a syndicate headed by Frederick W. Richmond, of New York. Stockholders will vote on the proposal next month.

In a report to company owners, Marcus A. Follansbee, president, pointed out that during first six months of 1954 the firm lost $414,511 after a tax carry-back credit of $427,624, for a total of $842,135.

"Recurring losses such as this have been the lot of many non-integrated steel fabricators," said Mr. Follansbee. Mr. Richmond asserts the company could not compete against well-managed and financed integrated concerns.

Caught In Middle

Significantly the company's facilities at Follansbee, W. Va., including two reversing cold strip mills, one cold finishing mill, and two continuous cold sheet mills, will be bought by Republic Steel Corp., shipped to Gadsden, Ala., for operation there. In short, equipment that could not be operated profitably by a non-integrated concern is considered a good investment by an integrated company.

Apart from stiff competition saleswise, the non-integrated companies have been caught in a squeeze resulting from perennial wage increases and other benefits won by steel workers. Higher wage costs have raised the prices of semi-finished and hot-rolled steel to the non-integrated mills, who in turn have had to raise the pay of their own workers.

On the other end their selling prices have been limited by what the integrated mills establish, plus the element of competition. Freight absorption has further cut into the profit margins of these steel producers.

HURRICANE relief. Kohler gasoline-powered auxiliary electric plants were flown to stricken Boston area.

Some Will Last

On the favorable side, the non-integrated mills shared in the postwar boom. Sales in the four years ended in 1953 were good, although limited to some extent by a scarcity of hot-rolled material. The forward-looking companies plowed their earnings back into the company, and the downturn found the industry in good shape from an equipment standpoint.

Another reason why observers hesitate to write off the non-ingrated producers: Many of them were founded long before World War II, and managed to survive hard times, including the depression of the 1930's. Quite a few of the smaller firms are family-owned or controlled.

Even under competitive conditions, many of the non-integrated companies are going to survive, particularly those who produce a specialized product to exacting physical specifications and tolerances. Also, some firms have diversified their production. Acme Steel, for instance, manufactures wire stitching machines, steel box strappings, and seals for box strappings.

MANAGEMENT

PLANNING: Why You Need a Will

Proper wills can prevent unnecessary payment of estate taxes . . . They can also help prevent necessity of selling a business upon death of the owner . . . But good wills must be tailored to needs.

◆ "PEOPLE keep telling me I ought to have a will." Ted Smith was talking with his attorney. "Now apart from the fact that you'll charge me a fee for drawing one, is there any real reason why I should?"

Ted was half joking and half serious. He was a practical businessman whose success in life was due in no small part to the fact that he had learned to distrust popular ideas as to what is the "thing to do." He liked to know the exact reason for every important step he took.

Often Put Off

"The answer to your question," said the lawyer, "is that a will in your case could be the most important paper you will ever sign. I tell you this even though I would probably make more money out of your estate if you died without one. So would a lot of people, such as bonding companies, the tax collector, and whoever picks up the stock of your business for a song when your administrator is forced to sell it."

Strong talk? Yes. But the lawyer knew he was on firm ground. The effect of a will on a man's family after his death can be profound, and in the case of Ted Smith who owned a majority interest in a thriving business, dying without a will or with an inadequate will could mean the loss of something it took a lifetime to build. Yet, from long experience, the lawyer knew that the drawing of a will is something many business men put off indefinitely—or handle in haste.

Knowing Ted's liking for facts and straight talk, the attorney first wrote down all the details concerning Ted's family and assets.

Ted was married and had a married daughter 24 and a son 18. Ted's principal asset was 55 pct of the outstanding stock of Smith Mfg. Co. Value of the stock was difficult to determine because shares had seldom changed hands, but on the basis of the company's earnings record and book value, Ted's shares would certainly be valued at over $400,000 for federal estate tax purposes. Ted also had other assets —his home, marketable securities and bank deposits which totaled about $200,000.

Like many men busy with day-to-day problems, Ted had only a vague notion of what would happen if he died without a will. He "guessed" his estate would go to his wife. He was surprised to learn that under the law of his state his wife would get only one-third. The other two-thirds would go to the children.

But there was far more to the story than that. There was the question of taxes. Ted was astounded to learn that the federal estate tax in his case if he were to die without a will would amount to $94,500 even assuming his wife survived so that some benefit of the marital deduction would be obtained for the one-third going to her. But by taking full, instead of partial, advantage of the marital deduction there would be a saving of over $30,000.

"You and your newly expanding overseas markets."

The attorney then said something that hit Ted right between the eyes. He described the fate of Ted's majority interest in the business if he died without an adequate will.

First, because Ted had no will appointing an executor, an administrator would have to be appointed who would be required to put up bond with sureties. Moreover, a court proceeding would be necessary to appoint a guardian for the share of the minor son, with more premiums for the guardian's bond.

Both administrator and guardian would then begin talking about selling stock of the business—simply because stock of the Smith Manufacturing Company was not a "legal" investment.

Under the state law the guardian would have to insist that at least the son's share of the stock be sold. Chances of getting a good price for the shares of this closed corporation at a forced sale would be slim, but the real blow would be reduction of Ted's 55 pct control to a minority interest.

Don't Be Hasty

By this time, Ted was so convinced of his need for a will that he wanted his lawyer to draw one while he waited. In the first place, he didn't like the way his estate would be distributed by the intestate law. He knew his estate could shrink in bad times; that sickness and emergencies could arise. He wanted his wife to have all benefits of his property while she survived him. Chance of her being subject to the charity of their children during her declining

years went contrary to Ted's wishes. In the second place, he wasn't enthusiastic about payment of $30,000 more estate taxes than necessary. And it went without saying that he didn't want his family to lose his business.

"But stay away from the fancy stuff," he said. "Just a simple will leaving everything to Dorothy . . . One of your $25 jobs," he added with a grin.

The lawyer smiled and thought how full the world was of people who wanted "just a simple will." A fair enough desire for people of little means, and there was no denying that in Ted Smith's case simplicity could be accomplished by a short will. He could leave everything to his wife or to the children if she did not survive, and appoint an executor and trustee for minors with adequate powers to continue the business if desired.

Get What You Want

This type of simplicity, however, can be both expensive and inadequate. Ted's thinking didn't go far enough. It stopped short at his own death. Further discussion made it clear that the will Ted asked for was not what he really wanted at all. And taxwise, leaving his whole estate, instead of a third of it, outright to his wife was jumping from the frying pan into the fire. This procedure would leave his estate wide open to an unnecessary tax exposure of $75,000 at his wife's subsequent death.

Passing the question of taxes for the moment, what did Ted really want in his will?

He wisely wanted his wife to have the benefit of his entire estate while she lived, but what about its management? Was she experienced enough to run the business? No, she knew nothing about it, had not even seen the inside of the plant. What about after her death? Well, of course he wanted the business to pass on to his children. In equal shares? Yes, although he supposed that meant the 55 pct voting control would have to be split. Worse than that, said the lawyer; if the daughter received her share outright and died leaving her estate to her husband, control could pass out of the family altogether.

It was evident from Ted's remarks that like most people he did not realize to what extent beneficial use of his property could be separated from its management after his death, thus protecting those dear to him from designing persons or their own inexperience.

Nor did he fully realize how by his will he could keep the voting effectiveness of his stock intact and control ultimate disposition of his estate to his children and grandchildren long after his death. That is the whole idea of a trust.

What Wills Can Do

But would a trust mean tieing up his property for years after his death? In a sense, yes, but a properly drawn modern trust would not tie the knots too tight. Trusts drawn in the old days were frequently too rigid to work well under changing economic conditions, but flexibility is the keynote of today's well-planned estate. Competent trustees would be given broad discretion with respect to both management of the trust assets and use of principal when necessary for the needs of the beneficiaries. In this way they would be able to cope with unforeseeable situations after Ted had died.

After a series of conferences, here was the plan that Ted and his lawyer finally worked out:

Control of Assets . . . Ted's brother, John, was an officer of Smith Mfg. Co. and had sound business judgment. One of the local banks had Ted's confidence and a well-staffed trust department. These would be the executors and trustees, with Ted's son becoming a third executor and trustee when he came of age. These three and their successors would have complete control of the estate for the duration of the trust which would last until Ted's wife and his two children had all died.

By giving his trustees adequate powers in the will, it would be possible to retain voting control in his estate—primarily for the benefit of his son, who was given special powers with respect to voting the Smith stock so long as his mother and sister were treated fairly.

But Ted wisely agreed he should make no mandatory directions concerning the retention of the stock of the business as an asset of his estate. There was no telling at this time where his son's interests would lie; what the family's situation or business conditions would be after Ted's death. Therefore the trustees were given broad powers to retain or sell the stock as the occasion warranted. If a sale should become advisable, they would at least have power to wait for the opportunity to make a good deal.

Beneficial Enjoyment . . . While Ted's wife was living she would receive half the income in any event and at the direction of the corporate trustee so much of the balance of income (and principal if needed) as was necessary for her support and comfort. If any income was not needed for this purpose, it would be paid to the children.

At his wife's death, she would have a general power of appointment over one-half the principal—the power to leave this half of Ted's estate by her will to anyone she wished. This, together with her guaranteed right to at least half the income, would qualify Ted's estate for the maximum marital deduction.

The other half, or all of the estate if Mrs. Smith did not exercise her power, would stay in trust for the children—income divided equally and again with adequate provision for use of principal if needed. Each child would be given the power to direct by will that his

Aid to Planning

Financial and legal advisors know that the drawing of a will is a job many businessmen put off indefinitely—or handle in haste. Yet it may turn out to be the most important document he ever signs.

This story on wills is the second in a series of articles on financial and estate planning The Iron Age is presenting with the cooperation of Provident Trust Co., Philadelphia, and its vice-president, John J. Buckley.

While it is hoped that these articles will prove helpful, especially to the small businessman, any contemplated action should be checked with your attorney—Ed.

"The difference between overtime and straight time is my wife's new convertible."

or her share of income could continue for the benefit of a surviving wife or husband. Subject to any such direction in the child's will, the income and ultimately the principal would pass on the child's death to his or her children, with alternative provisions if either child died without children surviving.

Administrative Provisions . . . The executors and trustees would be given broad powers over the management and investment of the trust without being confined to so-called "legal" investments. Moreover, they would be given power to take care of any beneficiary who was incapable of handling the payments due him from the trust, whether due to minority, sickness, or senility.

That is a summary of the will which was prepared for Ted Smith. Of course, Ted's estate plan would not be appropriate for everyone. A will must be tailor-made, and there are many styles and models.

Many Variations

In most small estates, outright distribution is usually advisable, with trusts only for minor beneficiaries. In other cases there should be a trust to last only during the widow's life, the principal going to the children at her death.

Even using Ted Smith's basic plan, there are numerous variations. Either or both children, for example, could be given the power to withdraw portions of his or her share of principal upon reaching certain ages, although such provisions must be drafted with due consideration to the danger of losing control of a business if, as in Ted's case, such control is by a small margin.

Worth The $100

One of the big advantages to the plan worked out for Ted was that it was designed to save his family thousands of dollars of unnecessary taxes—not only at his death but also upon the deaths of his wife and children. This will be the subject of the next article in this series.

The lawyer charged $100 for drawing the will. But when Ted considered the thousands of dollars which it would save his estate through avoidance of unnecessary taxes, administration expenses, and forced sale of his stock, he decided it was easily worth the cost.

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The EDISON Nickel-Iron-Alkaline Storage Battery, shown being watered here, was undamaged while in a fork truck that fell 4½ feet off the shipping dock.

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MCDONALD: Responsibility Is Keynote

USW chief stresses shared obligations of labor, management . . . Both must work for healthy steel industry . . . Rejects "Marxism", "bread & butter" union thinking . . . Stay with CIO—By J. B. Delaney.

♦ STEEL LABOR is wearing a new pair of long britches.

They were fashioned by David J. McDonald, president of United Steelworkers. He says they feel so good he's planning a coat and vest to match.

The new "outfit" — strikingly similar to one advocated by steel management—represents Mr. McDonald's philosophy on labor's and management's role in the successful operation of the industry.

Labor Shares Responsibility

Mr. McDonald calls his philosophy "mutual trusteeship." In short, he feels labor has an equal responsibility with management for the economic well-being of the industry, its employees and its stockholders.

The union leader's pronouncement was perhaps the most significant development at USW's seventh biennial convention in Atlantic City. In the steel industry it could lead to the long-sought promised land of lasting labor peace. If successful, it could be a major milestone in labor-industry relationships generally.

Rejects Extremes

Some observers believe Mr. McDonald laid his own union political future on the line with a declaration of policy so akin to that of management. It was a bold move that rejected the extremes of what he called Marxism and the strictly "bread and butter" approach that ignores the equity of owners and management.

Enemies within his own union and in the labor movement will be ready to lower the boom on Mr. McDonald if his unorthodox approach does not pay off.

As for McDonald, he says it has worked well during the last two years, and he plans to play it to the hilt from now on.

USW CHIEF David McDonald addresses steelworkers' convention.

This is the way McDonald puts it:

"We have been looking around, there is something in the world today, and we have been seeking for a phrase to describe it. The best I have been able to come up with is something like this: We are engaged in the operation of an economy which is a sort of a mutual trusteeship. What do I mean by that?

". . . Hundreds of thousands of stockholders own the great corporations of America, particularly in the steel industry . . . Those stockholders . . . employ a group of managers. Those managers are simply employees of those corporations. Then there is another group of employees known as the working force. Both of those groups have this mutual trusteeship who operate . . . all of these steel companies.

"This is their mutual trusteeship and in the operation of this trusteeship they are obliged to give full consideration to everybody involved.

"Certainly the managers must give full consideration to the just claims of the workers. *Certainly the working force must see to it that the steel properties are operated successfully, because if they are not operated successfully they will have no jobs.*

"Both, of course, have an obligation to the owners, to the stockholders, because if there is not invested additional investments, new money flowing into these industries, then of course we will have a decadence set in in our country. That we will not stand for."

Mr. McDonald points to the wage-insurance-pension gains of the steel workers in the last two years of over 20¢ an hour, adds:

"What does that mean? It means $550 million for the United Steelworkers of America. We do have something new in the world and we are going to develop it. We are going to enhance its operation."

The union president also told the

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steel industry that his organizing efforts are far from finished, that he's going after the technical and clerical employees whose numbers have grown with technology.

"You have engineers now where you once had mechanics," McDonald said. "You have electronics experts where you once had men with a screwdriver and a pair of pliers. Under those conditions we find that those people are not in our bargaining unions. I say to you you have got to organize them, because if you do not organize them in the steelworkers union, our union will lose by it."

Stay With CIO

Other convention developments:

McDonald disclaimed any intention of pulling the USW out of the CIO. He was critical of Walter Reuther, president of the CIO and the United Auto Workers, who he said was not giving enough time to CIO affairs. He said the USW's investment in CIO was too great to toss down the drain by disaffiliation. Nevertheless some observers believe that CIO-USW relations ultimately will deteriorate to the point where a break-off is inevitable.

Unemployment Eases

The nation's unemployment rolls shortened in the 149 major industrial areas from June to August, Labor Dept. reports, and signs point to moderate increases in the next few months.

The Department, in its bi-monthly survey of unemployment, found a marked improvement in four of the major labor market areas — Columbus, O.; Aurora, Ill.; Jackson, Miss.; and Kenosha, Wis. But it found the situation worse in two, Muskegon, Mich., and Charleston, W. Va.

Among the industries which expect to add workers to the payroll in the next few months are steel, aircraft, farm machinery, major household appliances and textiles. Fractional employment reductions are likely in ordnance, shipbuilding and tires and tubes. Major gains are forecast in the trades and services as the holiday season approached.

PDC: Spans Inventor-Producer Gap

New firm helps others diversify by finding new products . . . Works on fixed-fee basis . . . Asks nothing from inventors . . . Case history results show value of unique service offered—By W. V. Packard.

♦ PRODUCT DEVELOPMENT CORP. is a unique new firm that started clicking right from the start. It's a service organization which has already proven its worth in bridging the gap between inventors and manufacturers.

PDC's business is finding profitable diversification for its clients. Operating on a modest fixed-fee basis, the Boston firm can provide this service cheaper than the cost of one man per year.

But no idea is any better than its results, so let's examine a few cases to show how well PDC works.

Ideas Ring the Bell

Gillmors, Inc., Hicksville, N. Y., had been doing a lot of subcontracting work, making precision electromechanical equipment for aircraft and other defense applications. But the firm wanted to diversify so that it wouldn't be so dependent on defense orders.

Last November it asked John F. Rockett, Jr., president of PDC to look for new products it could make. One idea Mr. Rockett suggested was the Palpatron, a new medical instrument on which he had been working with a Boston doctor. Gillmors started producing the Palpatron last July.

The new instrument gives a continuous meter reading of a patient's pulse. It's quite simple, consisting of a box with a meter and control knobs and a pickup device. It can be strapped on any part of the body where the patient's pulse can be felt, and it gives a visual reading of a pulse too weak to be felt by a doctor's fingers.

The Palpatron has already proven a life-saver in more ways than one. And Gillmors is happy to be making an exciting, profitable, new product.

Another case history involves the Laconia (N.H.) Malleable Iron Co. The new product suggested was a ground anchor developed by Merton L. Clevett, Jr., a mechanical engineer in the Army's Quartermaster Corps and part-time inventor.

The anchor may be driven into the soil by manual means in less than 3 minutes—or less than 30 seconds by pneumatic machine. Operating on the same principle as an Indian arrow head, it has great holding power for its size.

Though the foundry is just getting into production on the anchor, it looks as if the new product will click. Less than 24 hours before hurricane Edna struck, a large landscaper called up and said he wanted immediate delivery of 10,000 of the anchors.

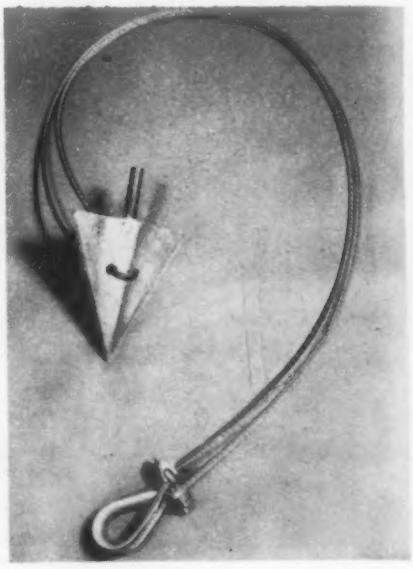
Solution of still another diversification problem didn't involve a new product at all. A New England manufacturer of clothes line had seen its sales steadily declining. Why? Because many people were moving into apartments, and many of those who weren't moving, were deciding to buy clothes driers.

PDC suggested its client wrap the clothes line about a painted board, package it attractively in cellophane, and sell it through supermarkets as children's swings.

Although the client still doesn't sell as much rope as it used to, it makes a lot more profit per foot.

Number one idea man of Product Development Corp. is its president, John Rockett. At 12, he won an award in a rural electrification contest sponsored by Westinghouse Electric Corp. At 19 he was doing secret development work for Atomic Energy Commission. By moving from job to job he deliberately broadened his background to become familiar with laboratory work, accoustical instrumentation, atomic instrumentation, automatic controls (servo-mechanisms), and guided missiles. He scarcely broke stride while getting an engineering degree. In his spare time he works on inventions.

At Transducer Corp. (later



LAND ANCHOR is one of the new products on which PDC helped bridge inventor manufacturer gap. Hurricanes helped sales of land anchor.

bought by American Machine & Foundry Co.) he was working under an option that required delivery of two new product ideas within 12 months. The option was picked up in 12 days, and he delivered 26 new product ideas in 12 months.

It was then that he thought of giving the same service to a number of companies. He ran a blind ad in *The New York Times* offering "Excess Profits For Sale." From this he received 26 inquiries and 34 job offers.

Product Development Corp. was born last November as an affiliate of already-successful American Research & Development Corp. The latter has proven a fruitful source of ideas for new products that do not seem to merit formation of new companies but fit in very well with diversification plans of many firms.

Who It Serves

Within 2 months the new firm was operating in the black. And it's doing better as it goes along.

The client list, still numbering less than a dozen firms, is confidential. Clients are limited in number to prevent conflict of interest; about one of each eight potential clients is signed. Present clients range all the way from a couple of textile men with $50,000 to invest, to a company with assets of over $300 million.

Simple contract calls for a fixed-fee retainer for 1 year at $5000 to $10,000, depending on size of company. Clients are encouraged to stay for 2 years.

PDC does not collect fees from inventors, but it does collect a commission from clients based on a percentage of any fee paid to inventors or other companies for patent or product rights.

Home Fix-Up Booming

Home fix-up has become a $6 billion-plus a year business, much of the expenditure finding its way into hardware dealers' cash registers.

A government survey disclosed that homeowners spent an estimated $3 billion for repairs, improvements, alterations, and additions to their homes in the first 5 months of this year.

DEFENSE

Stockpile:

GSA gets new buying goals on minerals, metals.

Bill for new federal buying of 22 critical materials for the national stockpile in the current fiscal year will be about $145 million.

Materials bought under this program are intended to help meet "minimum" stockpile goals, Office of Defense Mobilization says. A new ODM directive on buying for both minimum and long-term goals is now in the hands of General Services Administration.

By government direction, minimum goals are to be met without disturbing the market to any major extent and without interfering with present defense activities. Purpose of the long-term stockpile is to provide an added cushion of materials presumed vital for wartime purposes.

What GSA Will Buy

Those items to be bought as part of the minimum program include: aluminum, asbestos, bauxite, beryl, chromite, diamonds, fluorspar, manganese ore, mica, nickel, platinum, selenium, talc, tantalite, rare earths, and tungsten.

Suggested in the new ODM directive is a list of materials, including metals and minerals, which may be bought for supplemental stockpiling with the proceeds from sales of the government's substantial stock of farm crops.

Must File by Oct. 1

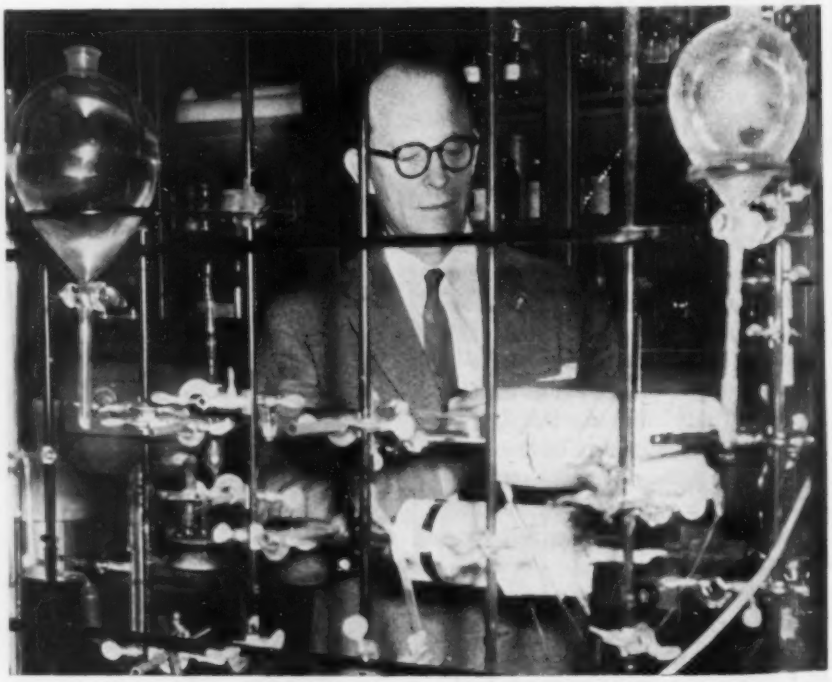
Defense contractors and subcontractors whose fiscal year ended in December 1953 must file required financial statements with the Renegotiation Board by Oct. 1.

These statements are called for in Sec. 105 of the Renegotiation Act.

Later, Renegotiation Board will set the time when contractors and subcontractors whose fiscal year began in 1953 and will end in this calendar year must file their financial statements.

Cut Army Cargo Costs

Improved cargo handling practices and lower costs of transportation are producing economies of almost $1 million this fiscal year, the Army reports. This sum is in addition to an estimated $1.2 million drop in freight rates expected by the Army in coming months.



ATOMIC scientist, Dr. W. F. Libby, has been appointed to Atomic Energy Commission, replacing Dr. H. D. Smyth who resigned recently.

Report To Management

Labor Secretary Mitchell has been the bull's-eye for brickbat hurlers ever since he took office. Union leaders have called him an Administration flunky, businessmen have criticized him for being overly pro-labor.

You can figure it didn't help his standing with the unions any, but his courage in knuckle-rapping the AFL at the union's annual convention last week should at least earn him considerably more respect from his critics in business circles.

Following closely AFL head George Meany's blasting of the Administration for its do-nothing approach to the unemployment problem, Mr. Mitchell accused the AFL of unfair political bias. Then he turned the knife, declaring the union had drifted away from founder Samuel Gompers' basic precept that labor should not identify itself with any political party.

Mr. Mitchell said it was hard to believe that the union was adhering to this philosophy "when criticism of an administration is all encompassing and takes no note of its intentions or accomplishments."

Among the advances for labor which Mr. Mitchell credited to the Administration were: (1) addition of 10 million people to the Social Security System, (2) increases in Social Security benefits, (3) extension of unemployment insurance coverage to an additional 4 million people, (4) public housing, highway and maritime construction programs.

He also declared that his department was enforcing labor laws more vigorously than the Democrats did when they were in control, pointing out that in the first half of the year 20 companies were made ineligible for government contracts because of minimum wage law violations. This was twice the number of firms blacklisted in the last 20 years, he said.

Mr. Mitchell indicated he did not expect the union to praise everything the Administration did but declared: ". . . if we were as confident of your support when we do something right as we are of your criticism when we do wrong, we would be even more effective on your behalf."

These are far different words than we are used to hearing from a Labor Secretary and it took lion's-den courage to make them at a union convention.

Retail sales of household appliances are generally down from last year. But bucking this trend, sales of TV sets are running slightly ahead of the '53 pace and for the year you can figure TV set sales will top '53's total of 6,371,000 units.

And of course another real boom for TV manufacturers is hanging fire. When colorvision really hits the market you can figure it will be almost like '48-'49 all over again. Once the general public has been thoroughly exposed to color TV in bars, friends' homes, they'll start screaming for it.

Odds are your firm's employees have beefs that top management never hears about. Some are legitimate, some aren't, but so long as they exist they are bad for morale and bad for production as well.

At Line Material Co., Milwaukee, they're making a concerted effort to eliminate these grievances. One method: A self-mailer is enclosed in the L-M house organ which employees can use to ask the president of the company any questions they have concerning company policy. The questions and the president's answers are published in the next issue of the house organ.

Queries range from "why are alcoholic drinks permitted at company parties?" to "why are most of the women workers at a certain plant being laid off?". In some cases the company makes changes as a result of the questions, in others an explanation is given as to why certain conditions can't be altered.

Whatever happens, end result is that causes of employee griping are greatly reduced.

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HOUSEHOLD APPLIANCES
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Like to speed up your reading?

Turn to pages 2 and 3 of The Iron Age every week and let the

Digest of the Week in Metalworking

help you find your favorite features.

IT PAYS TO READ IRON AGE ADS TOO!

INDUSTRIAL BRIEFS

New Warehouse . . . Heppenstall Co., Pittsburgh, now has a new Los Angeles warehouse at 6440 Fleet St. Don Madsen and Don Dutton represent the company in the Los Angeles area.

Prexy Elected . . . American Die Casting Institute elected William J. During president of the Institute at its annual meeting held earlier this month.

To Be Used . . . Ingram-Richardson Mfg. Co. has received a contract for the porcelain enameling of aluminum sheets and extrusions to be used as bulkhead partitions on the aircraft carrier *Forrestal.*

Distributor Named . . . Kaiser Aluminum & Chemical Sales, Inc., appointed Erin Metals Corp., Detroit, a distributor of Kaiser Aluminum ingot in the Detroit trading area.

Interest Acquired . . . Olin Mathieson Chemical Corp., New York, has acquired a substantial interest in Hunter Engineering Co. of Riverside, Calif.

New Plant . . . Wagner Bros., Inc., has consolidated all of its equipment manufacturing facilities in a new plant at 7800 Dix Rd. The main office is still located at 400 Midland, Highland Park, Mich.

Coming Up . . . The 14th New England Regional Foundry Conference will be held at the Massachusetts Institute of Technology on Oct. 29-30.

Southern Plant . . . Solar Steel Corp. now has a new steel warehouse plant in Nashville, Tenn.

Hear Ye . . . The newly formed Small Defense Industries Assn. appointed Walter P. Balderston, Jr., as executive secretary.

New Home . . . Frederic B. Stevens, Inc., has moved its Indianapolis district office and warehouse to 4000 E. 16th St.

Acquired . . . Continental Foundry and Machine Co., Pittsburgh, has acquired the bar and tube machinery line of the Medart Co., St. Louis.

Plans Complete . . . Eastern Metal Products Corp., Tuckahoe, N. Y., has completed plans to establish a midwestern operation for the production of its various lines to serve accounts in the area. Construction will begin shortly and the first part of the plant is expected to be ready for production in March 1955.

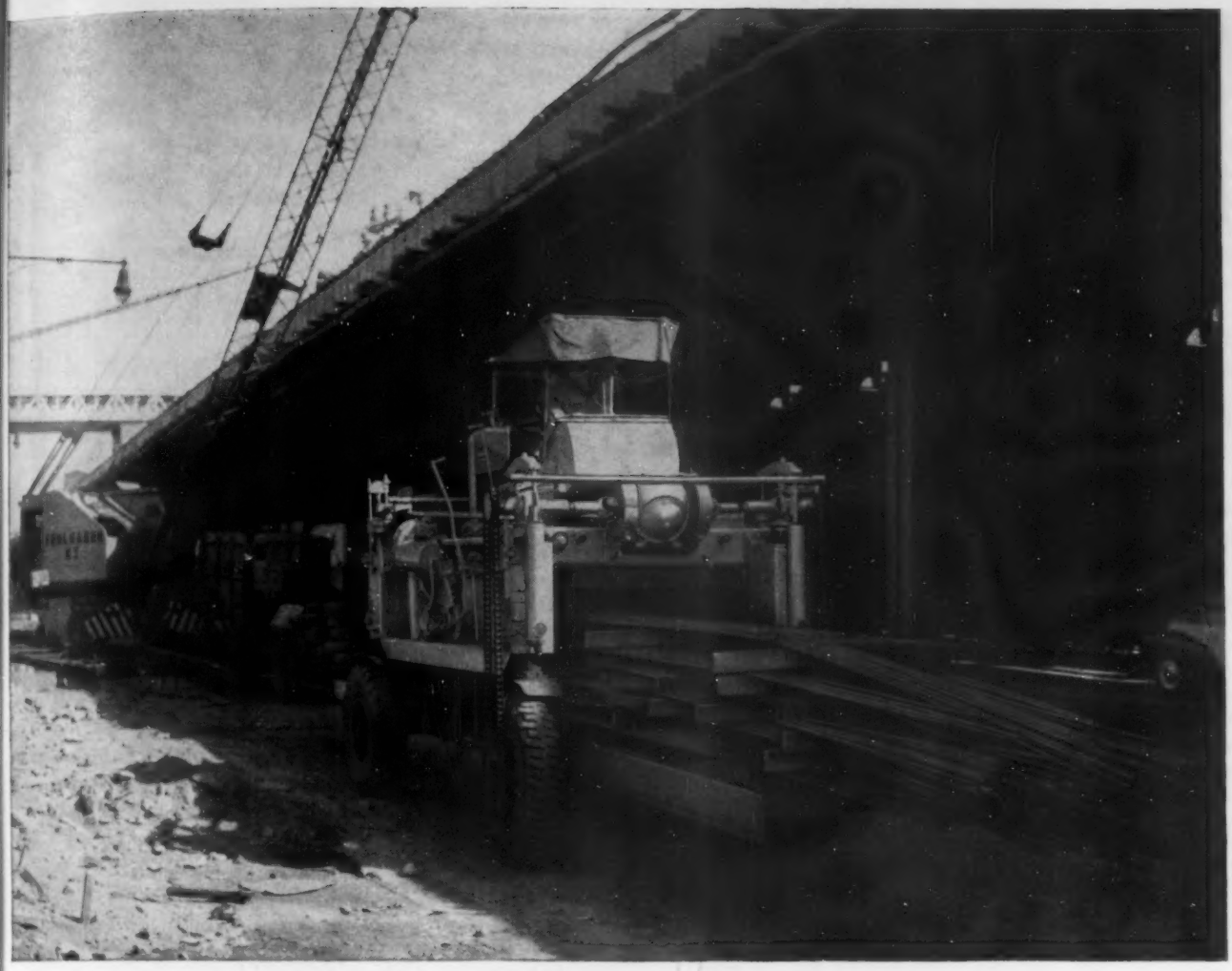
Congratulations . . . The Society of Industrial Realtors selected Frederick C. Crawford, chairman of the board of Thompson Products, Inc., Cleveland, as industrialist of the year. Presentation of a statuette symbolizing achievement in industry will be made in Cleveland on Nov. 10.

Company Purchased . . . American Chain & Cable Company, Inc., Bridgeport, Conn., purchased the Bristol Company of Waterbury, Conn. Purchase was made for the employment of surplus funds.

At Exhibition . . . Iver G. Freeman, vice-president, Reed-Prentice Corp., Worcester, is attending the 4th European Machine Tool Exhibition at Milan, Italy. He will also visit industrial plants in Switzerland, Germany, France and England.

Sales Office . . . Kaiser Steel Corp. just established a sales office in Phoenix, Arizona.

Establishes Plan . . . Surface Combustion Corp., Toledo, established a deferred payment plan for the purchase of the industrial equipment manufactured by its industrial divisions.



STEEL FOR THE EAST SIDE HIGHWAY—

delivered to the job-site at a saving of $2.50 per ton!

JOB FACTS:

Contractor: Fehlhaber Corporation
205 E. 42nd Street, New York City

Project: Extension for East Side Elevated Highway

Contracts: Erection of the substructure; construction of the superstructure

Problem: Delivering steel from storage yard to job-site, 1½ mile radius

Having seen the Clark-Ross Carrier in action in lumber yards, Mr. S. J. Winterberg, chief engineer of the Fehlhaber Corp., felt that it could be successfully applied to this job. During the erection of the substructure, the Carrier was used to handle steel piling 80 ft. long and weighing 4 tons each. For the superstructure, the Carrier delivers palletized loads of reinforcing steel. The different shapes are segregated by simple wooden bolsters, and are delivered to the job-site in pallet loads. A crane removes the steel layer by layer and drops it on top of the structure where the roadbed is being poured.

By the end of the project, approximately 8000 tons of steel piling and 2000 tons of reinforcing steel will have been handled. Mr. Winterberg estimates a saving in steel-handling of approximately $2.50 per ton.

Maintenance costs for the Carrier? "Not enough to notice," says Mr. Winterberg.

Discuss the benefits of Carrier-handling with your local Clark-Ross Dealer, listed in the Yellow Pages.

CLARK EQUIPMENT

ROSS CARRIER LINE
Industrial Truck Division
CLARK EQUIPMENT COMPANY
Benton Harbor 51, Michigan

☐ Send details on the carriers

Name_____

Company_____

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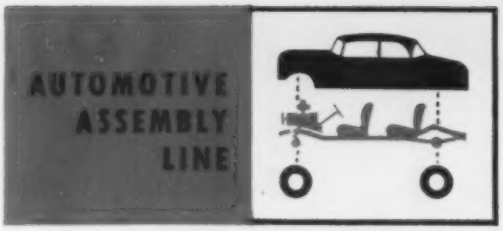
City_____ Zone_____ State_____



Studebaker Leads '55 Price Cutting

Independents will make some selective price cuts . . . Enabled by mergers, cuts will better market positions, aid dealers . . . Few will reach the consumer . . . Chrysler could make GM, Ford cut—By *R. D. Raddant.*

◆ FIRST PRICE cuts, announced by Studebaker for 1955 models, focus attention on prices across the industry.

Previous predictions still hold good, that there will be price cuts, but on a selective basis. Furthermore, some of the factory price cuts will never reach the car buyer, but will be aimed at helping some of the ailing dealer bodies.

There is a lot of feeling, and basis for the sentiment, that much of the industry's price concern is for its dealers, not the buying public.

Current Prices Equitable . . . This isn't so ruthless as it sounds. Total auto sales, although admittedly out of balance, indicate that current prices aren't too high to attract customers. The industry also knows that it can't possibly reach its buying public without a healthy and eager dealer body.

So the price cuts will come from manufacturers like Studebaker, where increased volume is necessary and where economics or savings in operations have made price cuts possible. Furthermore, in the pattern of the new Studebaker-Packard Corp., it is undoubtedly a prime objective to place Studebaker's lower cost lines in Chevrolet-Ford-Plymouth price-bracket.

For the record, representative Studebaker prices show reductions as high as $287 for the Commander Regal hardtop to $37 for the Champion deluxe station wagon. The former will now sell at $2215.23, bringing it much closer to other low priced cars.

Cuts Better Position . . . It is also significant that the biggest reduction occurs where it might do the most good in raising Studebaker's market penetration. It was felt around the industry that Studebaker had something to sell in the "sports car" styling of its hardtops, but was just a little out of line pricewise. The new cut should eliminate this handicap.

Meanwhile, James J. Nance, who is about to be named president of the new Studebaker-Packard Corp., says that S-P sales in 1955 should take in 4 pct of the market. He set Studebaker's production goal at 200,000 cars and Packard's at 100,000. It was confided to this column several weeks ago that Packard had its operations geared to show a profit on 100,000 cars. It might be concluded that the 200,000 figure is the profit point for Studebaker.

GM's PRESIDENT Harlow H. Curtice enjoys sampling the driver's seat of GM-built Vauxhall car in Britain.

Reflect Merger Savings . . . Studebaker's cuts were based on three factors: savings that should result from the merger with Packard, lower labor costs from its local union's recent voluntary pay and fringe benefit cuts, and a recent plant-wide economy drive.

Reverting to the industry pattern, it is unlikely that GM and Ford will cut prices unless forced to by the competition. Chrysler, which will bend every effort to regain its lost share of the market, may possibly do some price cutting. More likely, Chrysler's price moves will be aimed at helping the dealer body, which has suffered somewhat in the past two years. Chrysler is confident that its new styling and engineering will have no trouble on the sales floor, but this company still holds the key to Big Three price policies, could set off a series of cuts.

Prices as announced by the parent company are academic anyway, except as a barometer of the industry. Hardly anyone has bought a car of any kind in recent months without believing he was the beneficiary of a "deal," either through knocking down the list price or boosting his trade-in allowance.

Cadillac Gets Ordnance Job . . . Cadillac Div. of General Motors is scheduled to produce about $35 million worth of M-42 vehicles for twin 40 mm guns, under terms of a new contract signed with Army Ordnance Corps.

Automotive Production

(U. S. and Canada Combined)

WEEK ENDING	CARS	TRUCKS
Sept. 25, 1954...	53,391*	17,626*
Sept. 18, 1954...	59,797	14,229
Sept. 26, 1953...	116,635	24,318
Sept. 19, 1953...	122,537	24,375

*Estimated. Source: *Ward's Reports*

Markets:

Ford, GM expand overseas operations, profit.

A reviving European economy, an expanding automotive market, and relaxing of currency controls have renewed interest of U. S. automakers in their European operations.

Most tangible evidence of this interest was a $101-million expansion program announced in London last week by Harlow H. Curtice, GM president, for Vauxhall Motors, Ltd., GM's British subsidiary.

Mr. Curtice reported that GM had already spent substantially since the war on Vauxhall equipment and tooling programs. In typical GM fashion, he pointed out that "product development and costs must be kept abreast of world automotive progress." The funds will be spent for modern press plants and related facilities and the latest in machine tools and equipment.

Ford's Operations Extensive

Meanwhile, Ford Motor Co. is drawing attention to the fact that its overseas operations include manufacturing and assembly activities in more than 20 countries. In a new display at the Ford Rotunda, products of Ford of Canada, England, France and Germany are up for inspection.

They include Taunus passenger cars, diesels and vans, all products of Ford of Germany; Prefect, Consul, Anglia, and Zephyr-Zodiac passenger cars made by Ford of England, and a Fordson diesel tractor, made by Ford of England.

Ford international operations are not wholly-owned companies, but all have minority stockholders. Ford interests range from 52 to 85 pct. Last week Ford of France and Simca Motors voted to merge for a reason now familiar to everyone following the auto industry; limited volume made it necessary to broaden operations.

Platers are up and stainless salesmen down as the pattern for 1955 auto trim emerges from the first buys. In spite of efforts to convince automakers of the virtues of stainless, the trend is back to more plated carbon steel. Reason is pure economics. With more nickel available, it's cheaper.

Atop automotive engineer estimates that today's engines develop 0.5 to 0.6 bhp per cu in. With new engine tooling about completed for the next decade, problem is to increase this yield without changing. Higher compression, higher octane gasolines will give power boost.

Bodies:

Nash, Hudson share basic shell, big savings.

Of the "Little Three" merger-created corporations, American Motors is the first to make the switch to basic bodies. This is the area where most industry authorities conclude the biggest merger benefits can be gained.

In 1955 Nash and Hudson cars will be built on the same basic body shell and produced on the same assembly lines. This move will enable American to take immediate advantage of a manufacturing saving that will cut millions from tooling and fabrication costs.

The important move was disclosed by George W. Mason, chairman and president of American, in a letter to stockholders. He made it clear to loyal partisans that both makes will still be distinctly different in design and appearance and that each will have exclusive engine and mechanical features.

Show Quick Results

This integration will show results immediately after production of 1955 cars gets underway, but will begin to yield its real dividends in the second year of production with greater utilization of common or interchangeable parts.

In 1955 American will produce four different series of Nash and Hudson cars from a single body shell. American expects to cut body tooling costs in half through the integration.

THE BULL OF THE WOODS — **By J. R. Williams**

PROFIT IN MILLS

STEEL MILLS figure profit in mills per pound. So every mill you can save on production costs can be entered on the black side of your ledger. Let Texaco Lubricants and Lubrication Engineering Service help you keep production high, maintenance costs low.

Texaco Meropa Lubricant, for example, is especially designed for enclosed reduction gears — assures smoother operation, longer gear and bearing life. *Texaco Regal Oil* is the heavy circulating oil ideal for keeping systems clean and oil film bearings fully protected.

A Texaco Lubrication Engineer will be glad to help you gain extra mills of profit on every pound you roll. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

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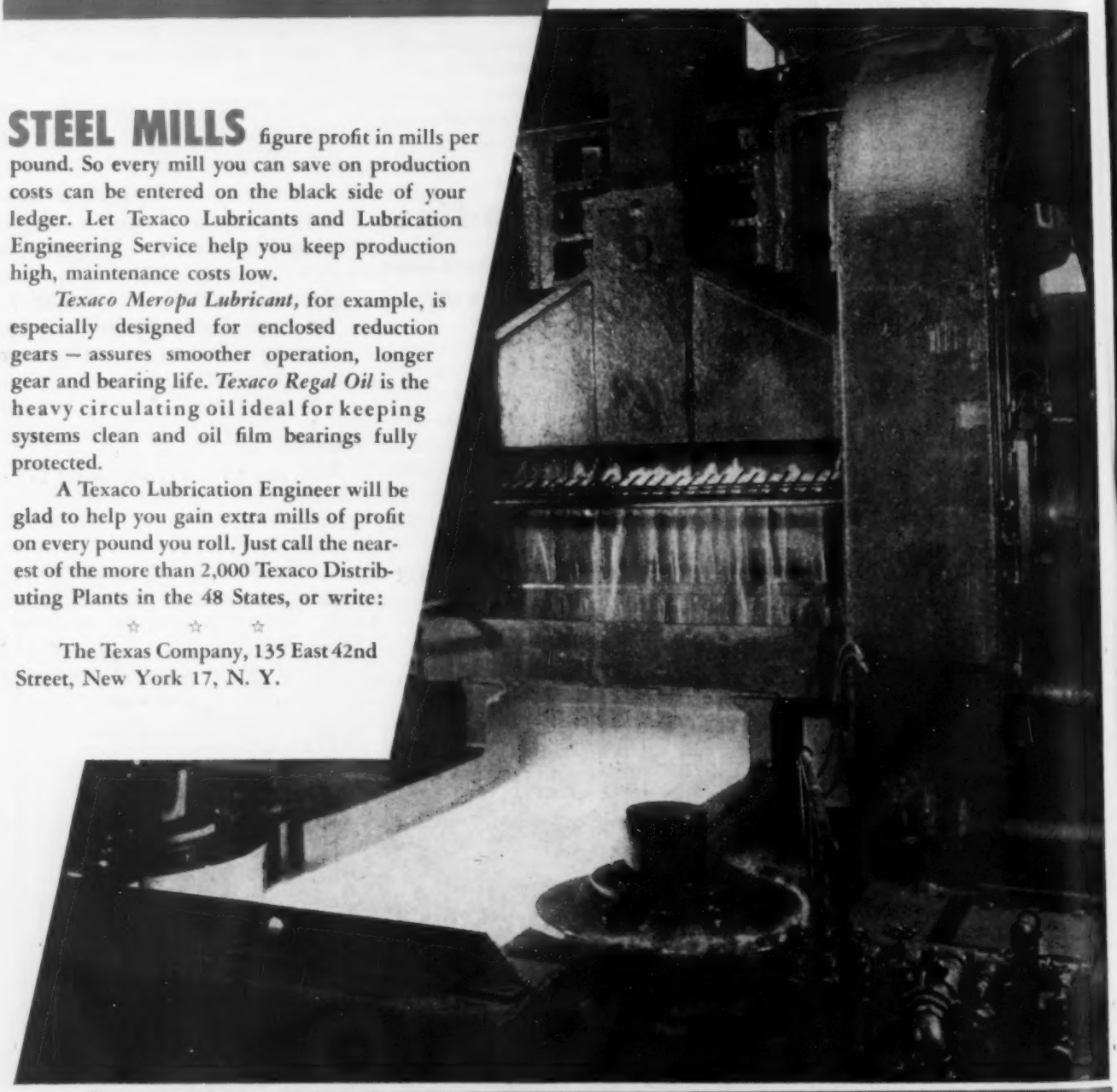
The Texas Company, 135 East 42nd Street, New York 17, N. Y.



TEXACO

TEXACO Lubricants, Fuels and Lubrication Engineering Service

Military Expanding Shopping Lists

Strong hints that Red attack on Formosa would uncork full-scale U. S. retaliation sparks defense buying . . . Expect machine tool orders in November . . . May alter foreign aid buying policy—By G. H. Baker.

◆ STRONG hints from the Administration that any Red attack on Formosa will uncork full-scale U. S. retaliation is encouraging military buying officials to beef up their industrial shopping lists.

Economy programs ("more bang for a buck") within the Defense Dept. were organized by Defense Secretary Wilson with the high-principled motive of saving the taxpayers some money and at the same time forcing the military services to sweat some of the fat from their operations.

Increase Buying . . . But the economy pinch is beginning to hurt military potential in a way it was never intended to apply. Reluctantly but firmly, the Administration is headed toward reversing the existing cut-back policy and instructing its procurement chiefs to increase their orders for military hard goods and machines needed to make them.

The first orders to be placed under the special $100-million fund for machine tool purchasing are to be placed in November or December. And guided-missile projects, having been given the inside track on procurement lists, are to grow by leaps and bounds in the months ahead. Other new contracts are now being written.

May Shift Buying . . . As business picks up, you can expect the Administration to abandon its stop-gap policy of awarding foreign aid contracts to U. S. unemployment areas. Harold Stassen's Foreign Operations Administration never liked the idea anyway, and will return to off-shore procurement of military and civilian supplies for the "free world" just as fast as the pick-up in business at home will permit.

FOA's recent decision to place railway equipment orders in the U. S. was not brought about easily. The agency first tried to ignore the appeals of businessmen from unemployment areas. But Congress grew interested in the situation, and public interest was aroused through a series of full-page daily newspaper ads. In the end, the foreign aid planners were forced to split the order for 100 locomotives 50-50 between Baldwin-Lima-Hamilton and the Japanese Rolling Stock Export Assn.

Want Seaway Work . . . Firms seeking contracts on the St. Lawrence seaway project should communicate with the U. S. Corps of Engineers, Buffalo, N. Y.

The Buffalo office has been designated by Martin W. Oettershagen, deputy administrator for the Seaway Development Corp., as the main office responsible for preparing plans, contracts, specifications, solicitation of bids, awards of contracts, and job control.

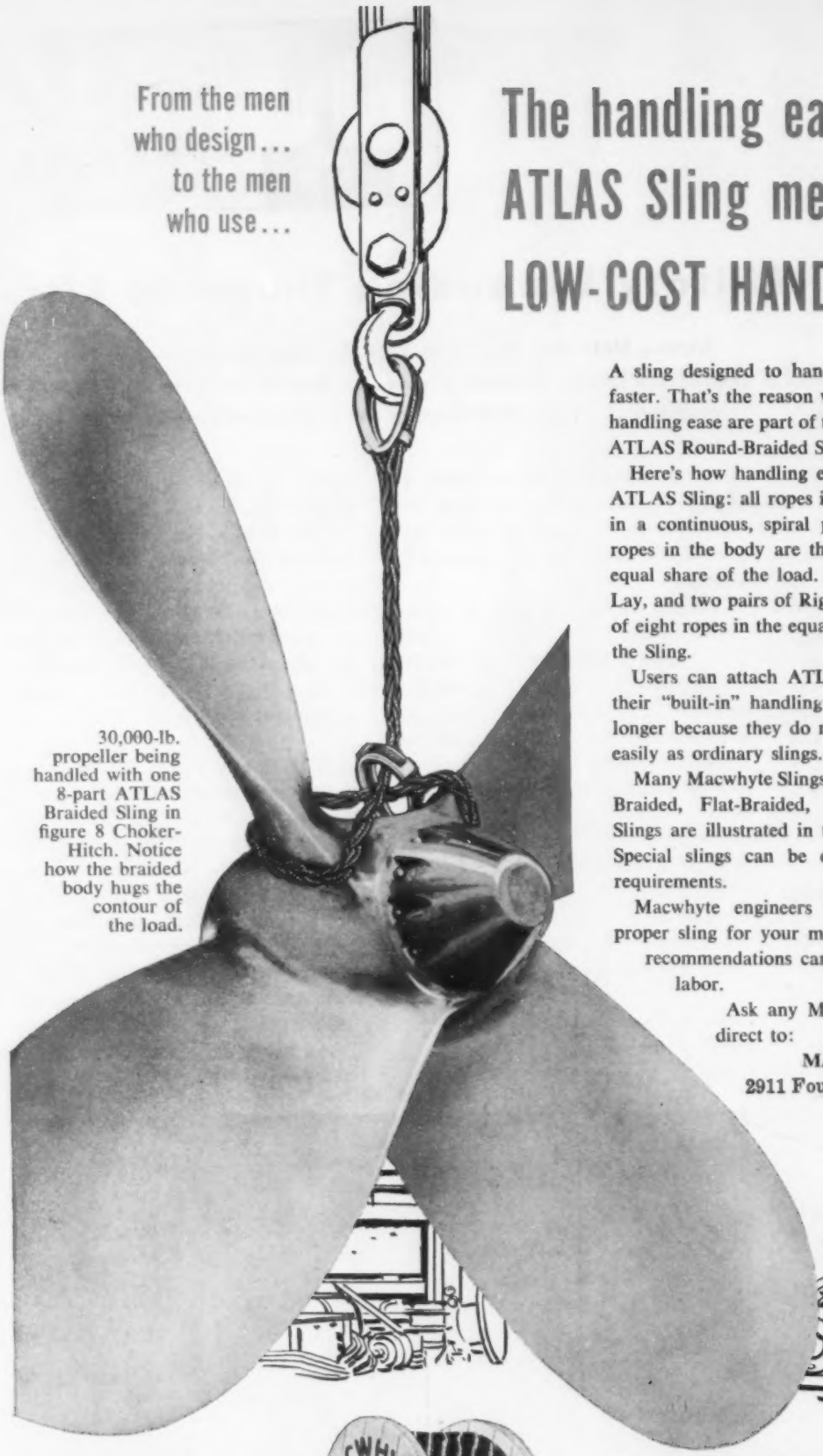
Will Check Farm Market . . . Farm mechanization will be one of the areas surveyed on the federal census of agriculture to be taken in October and November. Census Bureau officials will determine the number of tractors, crop harvesting and planting equipment, cars and trucks, and the extent of electrification on the country's farms.

Results of the survey will be published along with the censuses of business in about two years.

PRESIDENT EISEHOWER dons a smokejumper's helmet at Missoula, Mont., in a ceremony dedicating $700,000 Northwest forest firefighting depot.

From the men who design... to the men who use...

The handling ease of an ATLAS Sling means safe, fast, LOW-COST HANDLING



30,000-lb. propeller being handled with one 8-part ATLAS Braided Sling in figure 8 Choker-Hitch. Notice how the braided body hugs the contour of the load.

A sling designed to handle easily will handle loads faster. That's the reason why flexibility, lightness, and handling ease are part of the basic design of Macwhyte ATLAS Round-Braided Slings.

Here's how handling ease is built into the finished ATLAS Sling: all ropes in ATLAS Slings are braided in a continuous, spiral path. Ropes are endless—all ropes in the body are the same length and carry an equal share of the load. There are two pairs of Left Lay, and two pairs of Right Lay ropes—making a total of eight ropes in the equally balanced-braided body of the Sling.

Users can attach ATLAS Slings faster because of their "built-in" handling ease. And these Slings last longer because they do not snarl, kink, or curl up as easily as ordinary slings.

Many Macwhyte Slings of standard design in Round-Braided, Flat-Braided, Single-Part, and Grommet Slings are illustrated in the Macwhyte Sling Catalog. Special slings can be designed to meet individual requirements.

Macwhyte engineers will gladly recommend the proper sling for your material handling needs. Their recommendations can save you time, money, and labor.

Ask any Macwhyte distributor, or write direct to:

MACWHYTE COMPANY
2911 Fourteenth Ave., Kenosha, Wis.

Send for Bulletin 5308 containing load rating tables, illustrations, and general information on slings.

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Manufacturers of Internally Lubricated PREformed Wire Rope, Braided Wire Rope Slings, Aircraft Cables and Assemblies, Monel Metal, Stainless Steel Wire Rope, and Wire Rope Assemblies. Catalogs available on request.

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1064-I

Draft:

Pentagon readies military manpower plans.

Scheduled for completion well in advance of the opening session of the 84th Congress is the proposed Defense Dept. plan for strengthening the military Reserve program to make better use of America's tight manpower supply.

Though Defense Secretary Wilson prefers to steer clear of the term "compulsion" in connection with Reserve service of men who have completed an active-duty tour, it is obvious now that he is ready to seek stringent measures to insure an adequate Reserve for defense purposes.

Talk of Industry Aid

He acknowledges a need for methods of enforcing completion of Reserve obligations, but as of last week he had not called on industry for advice on this score. Question of industry aid has been "discussed" in the Pentagon, Mr. Wilson admits.

Maintaining a pool of trained men who may be called on for further active duty is only one of five manpower principles the Defense Dept. is trying to follow. The other four are:

To provide sufficient numbers for armed forces missions, both in the U. S. and abroad; to keep the induction age at the proper level; to maintain a pool of military-eligible men; and to make for equity of military service.

Complicating the problem of providing enough men to enable the services to carry out their commitments is the fact that only about 850,000 physically and mentally acceptable young men enter the draft range each year. Mr. Wilson figures this means the services must keep 300,000 uniformed men per year interested in continuing their service.

UMT Illogical

Shoved into the background by current Pentagon manpower plans is the perennial question of a universal military training law. Mr. Wilson considers it illogical to set up a UMT program calling for 6 months' training at this time, when the armed forces "practically need all the young men in the country" for 2 years of duty.

Taxes:

Ike to renew plea for manufacturers' sales tax.

New efforts to secure a national manufacturers' sales tax will be made when Congress returns in January. The Eisenhower Administration, glumly watching the gap between income and spending climb again, is looking for new sources of revenue.

The proposal will be termed a "non-discriminatory" tax on the "wholesale value of manufactured products," to remove the public objection to a sales tax. An increasing number of industries will drop their opposition to the tax if it is applied uniformly to all products.

Against Hidden Tax

Retail representatives, generally, seem to be still opposed to any "hidden" taxes, preferring that they be collected at the retail level so that the consumer will know how much the item costs and how tax is being added to the price.

In its annual budget review for the fiscal year which began July 1, Treasury Dept. reported that the deficit will run about $4.7 billion, $1.7 billion more than last year, as a result of reduced corporate profits.

Need Maintenance

Indications of a broadened South American market are seen by U. S. suppliers of shop equipment for overhaul of tractors, motor trucks, and farm vehicles.

These businessmen are getting an urgent call to send their catalogs or brochures to a government mission to Colombia. Foreign Operations Administration advises that the official to address is:

L. W. Lowe, Chief of Machinery Project, USA Operations Mission to Colombia, Institute of Inter-American Affairs, c/o American Embassy, Bogota, Colombia.

WASHINGTON NEWS

The Eisenhower Administration is determined to balance the budget, which means that new sources of revenue will have to be found. Many treasury officials believe a sales tax is the best source.

Building:

Dollar volume hits alltime peak in August.

Continued strength in the construction industry, especially the nonfarm housing segment, is reported by the U. S. Labor Dept. Work was started on 111,000 units in August, to bring the total for the first 8 months of the year to 780,000, 3 pct above last year.

August's activity was 17,800 units more than the same month a year ago. Seasonally adjusted August starts were at a 1,130,000 annual rate, compared with last August when the rate was only slightly over 1 million.

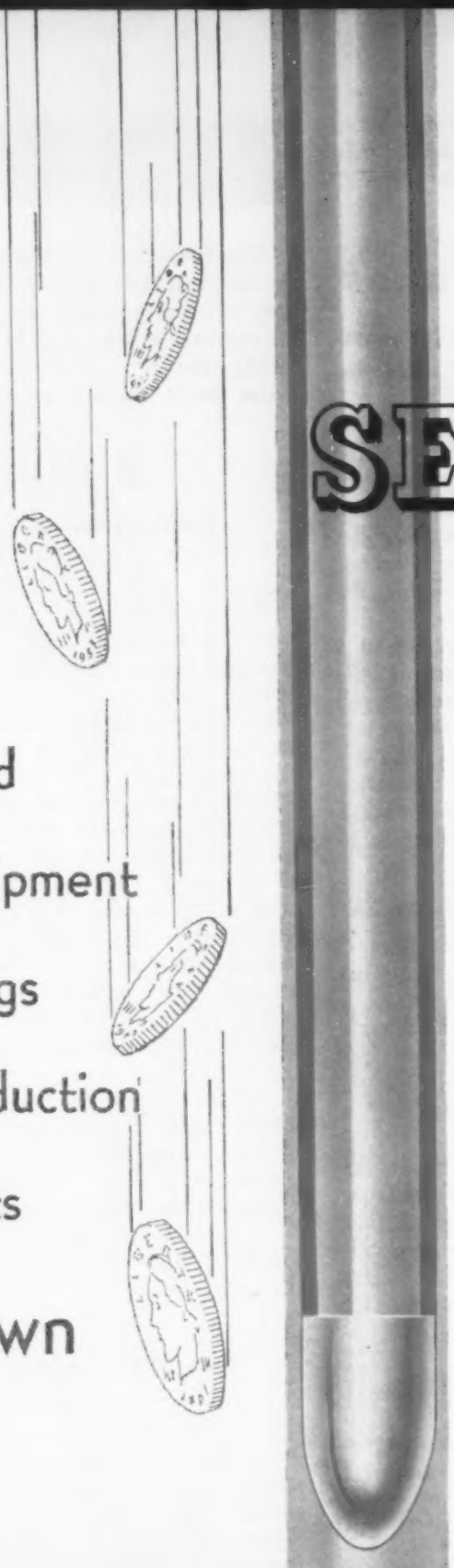
For all types of construction, some $3.6 billion was spent in August, the second successive month in which expenditures reached an alltime high. Total dollar volume of all construction for the first 8 months of this year reached $23.7 billion. In August, the main gains were in private home building, public utility construction, and highway work.

Bus Mail Income Up

In the intercity bus industry, there is an encouraging outlook for development of a much more profitable business in the moving of mail, express, and newspapers.

Revenues from the transportation of these items by Class I intercity lines during 1953 were about 17 pct higher than those for the previous year.

This gain is disclosed by National Assn. of Motor Bus Operators, which notes that the increase was concurrent with a rise in the percentage of income gained from charter and special-service operations in the same years.



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good equipment brings production costs down

Every improvement in seamless tube mill equipment has been developed by the combined efforts of the steel industry and Aetna-Standard. That's one reason why Aetna-Standard builds more seamless tube mills than all companies combined. If you contemplate adding tube facilities or revamping existing equipment, call in Aetna-Standard. Such data as costs, rates of production, amortization, equipment details, will give you good information on which to base a decision. **Only from Aetna-Standard can you obtain this authoritative guidance.**

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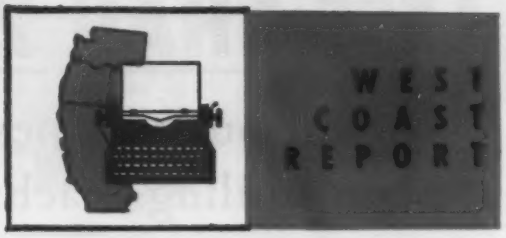

Power Needs Are Big Coast Issue

Senatorial candidates in Oregon campaign argue public vs. private development, ownership of electric power facilities . . . Seek new hydroelectric plant sites . . . Plan 1800-mile oil pipeline network—By *R. R. Kay.*

♦ POWER, basic to West Coast development, kept hot in the news from Canada to California. As President Eisenhower dedicated the $286 million McNary Dam on the Columbia River, Washington-Oregon border, he defended his power policies, counselled against Government monopoly. ". . . Believers in centralization fail to warn us that monopoly is always potentially dangerous to freedom —even when monopoly is exercised by Government."

Power and politics began to mix it up in Oregon. The November Senatorial election fight is on—incumbent Republican Sen. Guy Cordon, for government-private enterprise partnership in power development, vs. Democratic state-senator Richard L. Neuberger, champion of public power.

Study Canadian Site . . . British Columbia's Minister of Lands, Forests and Mines granted Kaiser Aluminum & Chemical Corp., Oakland, Calif., permission to launch engineering and geological studies for a $25 million storage dam. On the Columbia River in Canada, it would provide water for downstream power facilities in the U. S.

Pacific Gas & Electric Co., San Francisco, is going ahead with the $37.6 million Poe hydroelectric project on the north fork of the Feather River in northern California. Project will develop 106,000 kw. Construction includes two steel penstock pipes and a powerhouse with two generating units. Work is scheduled for completion by 1958. Company engineers' estimate of steel needs: reinforcing steel, 1600 tons; plate for penstock and gates, 1400 tons; and structural steel, 1000 tons.

Develop Bay Area's Power . . . East Bay Municipal Utility District, Oakland, Calif., has a preliminary Federal Power Commission permit for a hydroelectric project on the Mokelumne River in Amador, San Joaquin, and Calaveras counties, Calif.

Southern California Edison Co., Los Angeles, plans a $40-million expansion of its Big Creek, Calif., facilities. The reservoir and 126,000 kw power plant will be ready in about 3 years.

Predict Steel Uptrend . . . Bethlehem Pacific Coast Steel Corp.'s President H. H. Fuller, commenting on the steel outlook on the West Coast, told THE IRON AGE his company's business has been improving slowly month by month, and is operating slightly in excess of the industry's national average.

"I think a gradual increase in requirements for steel products will continue. Although I don't see prospects of a great upsurge, we may go into the fourth quarter with a 70-75 pct operating rate."

There is a slow but definite increase in buying, Mr. Fuller reports. Inventories are in much better balance. There's a great deal of construction work of all kinds requiring steel, with a noticeable increase in building construction in southern California.

Plan Pipe Network . . . A $100-million web of pipelines may soon be spun over the Rocky Mountains, Arizona, and New Mexico. Eighteen-hundred miles of pipe will go into three crude and two products lines.

PUSHBUTTON in Ike's right hand starts generators operating at dedication of giant McNary Dam hydroelectric project on the Columbia River.

LESS THAN 23 CENTS PER HOUR

will put this new 3-hp, No. 2, Model CHL plain milling machine to work in your plant with

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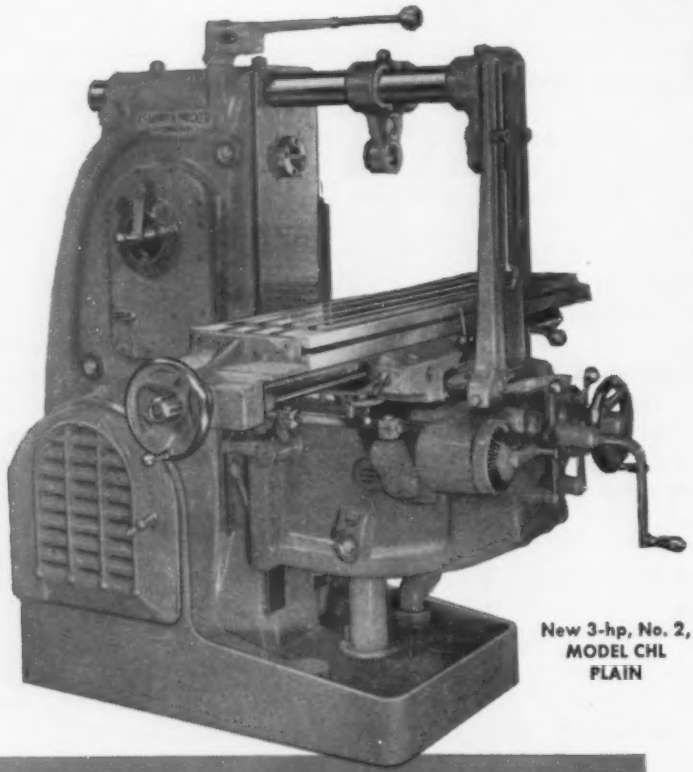
TOOL-LEASE

PROGRAM



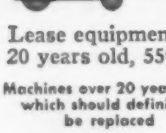
New 3-hp, No. 2, MODEL CHL PLAIN

NO! We didn't make a mistake. Under Tool-Lease Plan "A", one of three seven-year lease agreements offered by Kearney & Trecker, you are asked to make two semi-annual rental payments, totaling 25% of the machine's price during each of the first three years. Actually, in dollars and cents, you are asked to invest approximately 23 cents per hour for a new 3-hp, No. 2, Model CHL plain milling machine. That means a machine installed in your plant and in operation — for pennies an hour!

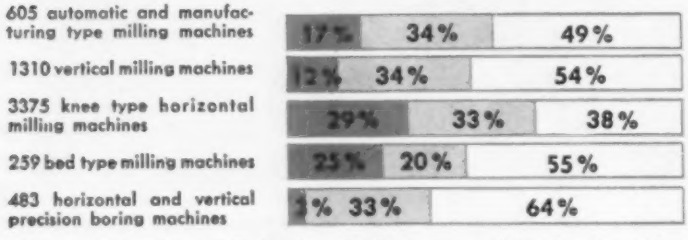
What's more, under Tool-Lease, you can rent any of over 250 standard milling machines or precision boring machines. All are available under three basic plans, with varying options to continue or terminate the lease, or to purchase the equipment. If you require special machinery or heavy-duty CSM bed types, special agreements will be considered.

For complete information on Tool-Lease, see your Kearney & Trecker representative, or mail coupon to Kearney & Trecker Corp., 6784 W. National Avenue, Milwaukee 14, Wisconsin.

MACHINE TOOL OBSOLESCENCE IS BECOMING CRITICAL! WHERE DO YOU STAND?



Here's the picture in a typical industry — GENERAL INDUSTRIAL EQUIPMENT — (see chart below). Of the 6032 standard knee type horizontal, vertical, bed and manufacturing type milling machines and precision boring machines in use today — which can be replaced by Tool-Lease equipment — 22% are more than 20 years old, 33% are 10 to 20 years old, 55% are more than 10 years old!



Figures adapted from 1953 American Machinist survey of metalworking industry

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Weigh Vance Plan Tool Types

Expect first Vance Plan contracts will go out in November or December . . . Armed forces lay needs before Defense Dept. planners . . . Air Force says it's ready to go . . . Army, Navy slower—By *E. J. Egan, Jr.*

♦ INFORMATION describing just which new magazine tools the military forces believe they should be allowed to buy with Vance Plan funds is being weighed by top logistics officials in the Defense Dept.

Data supplied to these officials by the Army, Navy, and Air Force will have considerable bearing on the types of tools which will be ordered soon with the $100 million Congress made available this year specifically for tool purchases.

Best estimate is that first contracts for tools will go out in November or December.

Air Force pronounces itself ready to start this program. It has submitted its data on precisely those tools it wants, though it hasn't yet opened discussions with tool builders. Typically, the tools desired by the Air Force are those that have a long lead time.

Army, Navy Slower . . . The other two services are more reticent about their state of readiness, but it is apparent that Defense Dept. still does not have all the information needed to give the go-ahead signal on buying. That lack is expected to be remedied within a short time.

Defense Dept. officials are interested in a great many more tools than the necessarily limited number which may be bought with Vance Plan money. In addition to keeping a close watch on new procurement, they also want to know what production equipment is now owned and how much of it is worth keeping for future use.

One estimate, unofficial but believed sound, is that in the machine tool category the military services own upwards of 400,000 items. Some of these may be unusable in a future emergency, and a recent Defense Dept. instruction to the services outlined conditions under which tools should be retained.

Tools intended for use in a specific type of production and those capable of performing general tasks are to be kept if they meet either of two requirements. They must be able to do the jobs for which they were built, or they must be in a condition that permits an economical reworking to put them in operable shape once more.

Will Test Tools . . . Need for keeping equipment on hand is to be weighed against changes in requirements at least as often as every second year. The services are told to dispose of those items no longer needed for planned mobilization production purposes.

Tests must be run on metalworking tools which have been used since they were manufactured or rebuilt, but are not yet placed in storage.

Also to be tested are those machines put in storage before operating data were collected. However, if a tool is expected to become obsolete or excess in 5 years because of a change in the end product, the military departments may request that the test be omitted.

Stored metalworking equipment not now operable is to be put in usable condition within 5 years if there is a future need for the tools and if reworking can be done economically. The rate of this operation is to be not less than 20 pct of the total machines each year.

"He'll walk all over you, if he gets the chance."

Name Speakers . . . Ralph E. Flanders (R., Vt.) will be the principal speaker at the 30th annual meeting of the American Machine Tool Distributors' Assn. The 2-day convention is scheduled for Oct. 18-19 at Cincinnati's Sheraton-Gibson Hotel.

Other speakers include: Ralph E. Cross, deputy administrator of the Business & Defense Services Administration; H. L. Tigges, president of the NMTBA; Mr. Berna; and Dr. William V. Gilbert, machinability consultant to the General Electric Co.

Also on the program of speakers are Charles Clark, Cincinnati Milling Machine Co., and John M. Riordan, chairman of Riordan Machinery Co., Detroit.

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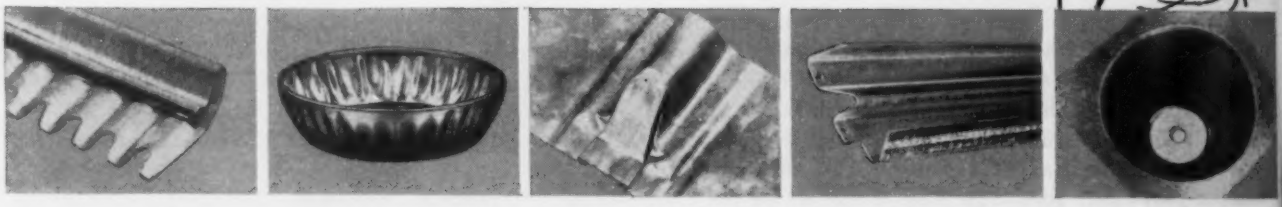

Whether your products require stamping, drawing, spinning, bending, crimping or lock-seaming, Inland TI-CO will make them better, longer lasting, at a lower cost.

The secret lies in the TI-CO process that produces a sheet with A ZINC COATING THAT WILL NOT FLAKE!

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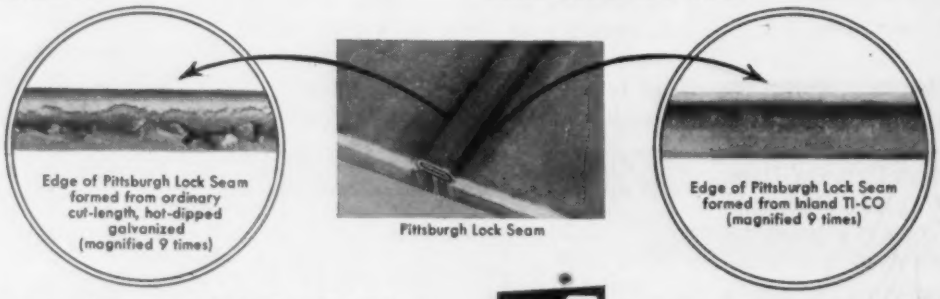

Manufacturers who have switched to TI-CO report considerable savings in elimination of redipping after forming, in machinery "down time" caused by zinc clogging and in substantial reduction of rejects. They have a more attractive, a more saleable finished product too!

Get the whole story on how TI-CO can help you produce better galvanized products for less—and turn out new products not practical with ordinary galvanized sheets. Write today for new TI-CO catalog.

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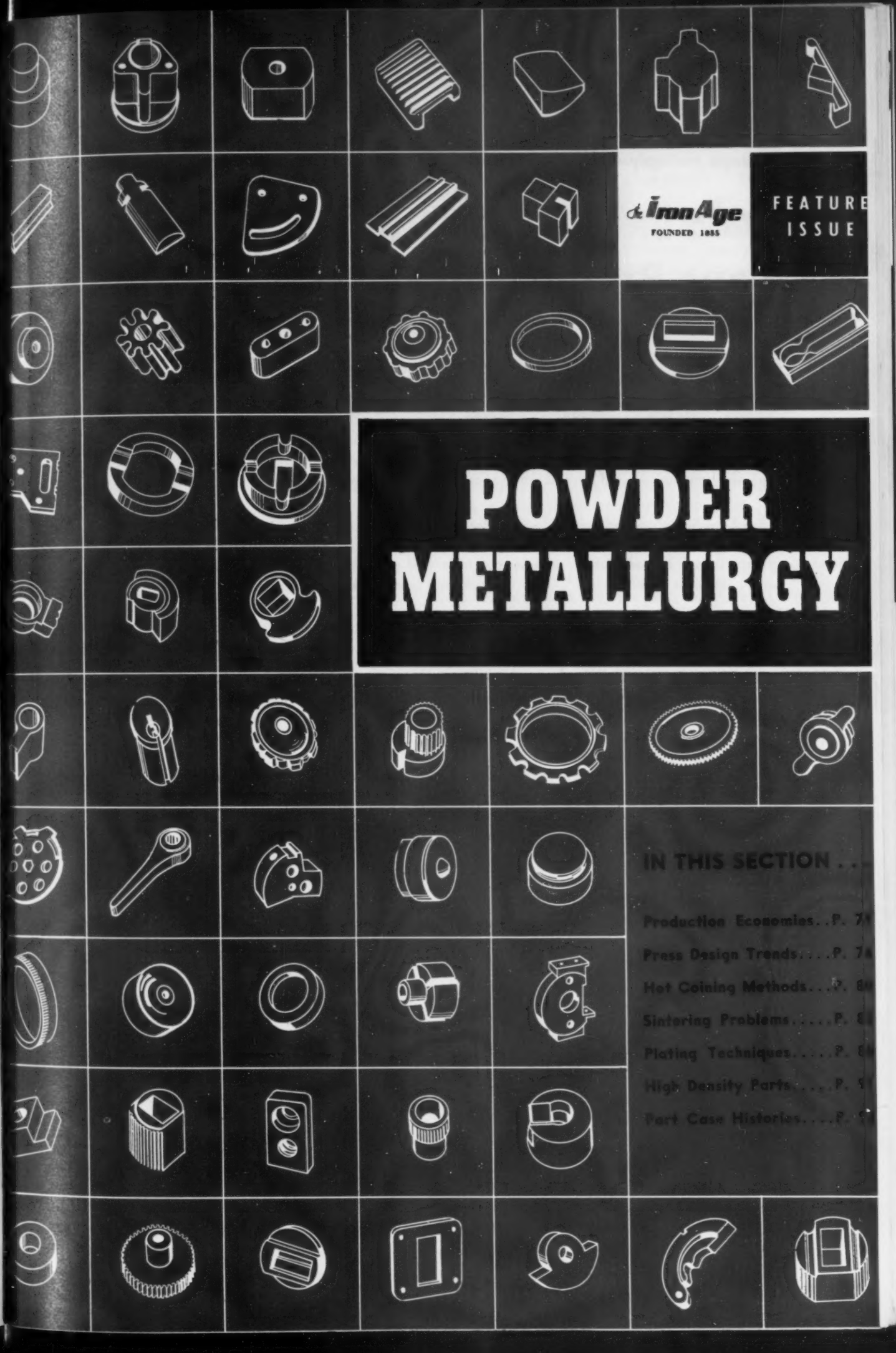


The Iron Age
FOUNDED 1855

FEATURE ISSUE

POWDER METALLURGY

IN THIS SECTION . . .

Savings multiply—

POWER METALLURGY Can Lower Your Production Costs

By B. T. DuPont Sales Manager, Plastic Metals Div., The National Radiator Co., Johnstown, Pa.

◆ Potential savings which powder metallurgy techniques make possible are often high . . . Raw material cost may be higher than for materials used with other fabricating methods . . . But beyond that first cost over-all savings can multiply rapidly.

◆ Total number of operations can be considerably reduced . . . Much handling in fabrication can be eliminated . . . Over-all design may be simplified . . . Machining and assembly operations may be reduced or eliminated . . . Unusual physical and mechanical properties, not available in other materials, may be built into powder metal parts.

◆ PRODUCTION OF PARTS by powder metallurgy techniques offers manufacturers a number of potential cost economies. Savings permitted by the process result from: (1) Elimination or reduction of machining operations. (2) Reduction in handling operations. (3) Practical elimination of waste metal in the form of machining scrap. Close dimensional tolerances can be maintained with relatively little trouble and few rejects.

Even though the job may begin with a somewhat higher-first-cost raw material in the form of powder, savings accumulated along the way in fabricating a well-designed part can result in an impressive reduction in finished-product cost.

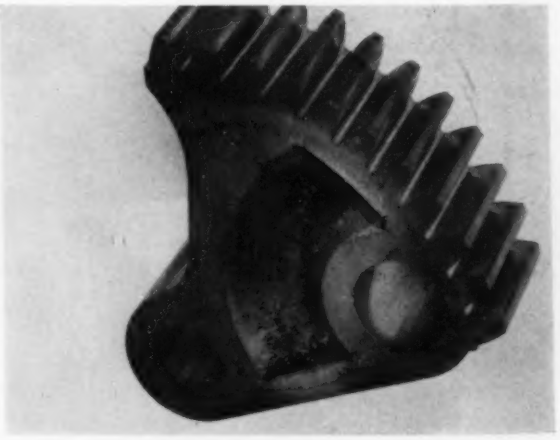
From an engineering standpoint, a part designed for another method of manufacture sometimes lends itself to metal powder fabrication with little or no change. Greater cost reductions and product improvements however can often be effected by changing the design of subassembly machined parts so that they can be fabricated as single articles. When an entirely new part is created, powder metallurgy frequently permits savings by eliminating the need for machine tools, jigs, fixtures, cutting tools, gages, etc., and, at the same time, get the unit into production faster.

Beyond the savings in original costs, powder metal parts frequently outwear hardened steel because of their conformability, smooth surface and oil retaining, self-lubricating qualities.

The powder metallurgy technique consists of compacting metal powder under high pressure in a suitable die and subsequently sintering or heating the compact so that the particles are "welded" together into a strong useful article.

Metals of widely different melting points, or characteristics can be combined to form parts having excellent physical properties. Silver and copper can be combined with tungsten; zinc, nickel, silver or copper with chromium or ferro-alloys.

Laminated parts can be produced having different characteristics in the different sections.



QUADRANT GEAR, impregnated with copper during sintering, withstands high impact loads.

Switch contacts made of a combination of tungsten and copper or silver have the high conductivity of the latter two elements and the high resistance-to-burning of tungsten. Combinations of tungsten and cobalt or nickel powders are used in producing our cemented tungsten-carbide high-speed cutting tools.

Examples of the use of combinations of divergent materials are graphite and bronze bearings, copper and graphite electrical brushes, iron and graphite bearings, copper and porcelain resistors, insulated iron particle radio-coil cores, and many others. Such parts can be made to precise dimensions, and the physical properties can be varied to suit the need—hard or soft, strong or weak, dense or porous. Controllable porosity from 50 pct voids to essentially absolute density is a unique feature of powder metallurgy that offers special properties including self-lubrication, extraordinary softness or malleability, etc.

The burnishing action which takes place during ejection of the piece from the die puts a mirror-like finish on the working surfaces of parts such as gear teeth, etc. This availability of "super-finishes" along with the oil retention properties gained from controlled porosity, affords unusually long life for properly designed and used parts.

Mechanical properties improved

If the part is to be hardened, graphite powder can be mixed with the iron powder before the part is compacted. Carburizing then is effected, either partly or in full, as the part passes through the sintering furnace. Case hardening of iron parts also may be attained by conventional gas carburizing and other after-treatments of the sintered compacts.

Where additional toughness, strength, or density is necessary, the pores of a compacted iron part can be infiltrated with copper or copper-base alloys by laying a thin sheet or slug of this material on the part as it enters the sintering furnace. When the part reaches a temperature at which the lower melting point infiltrating metal becomes molten, the copper, brass or other alloy is literally sucked into the pores throughout the iron compact by capillary action. A unique physical combination of iron and copper is formed.

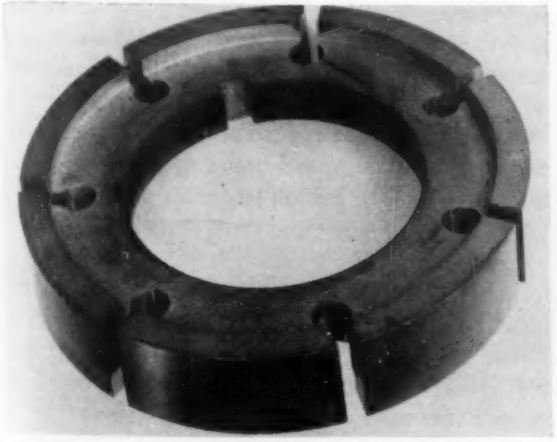
This infiltrating method is used for a quadrant gear manufactured by Moraine Products Div., General Motors Corp., Dayton, Ohio. For use in domestic washing machines, the gear must withstand high impact loads. The finished unit is made in one pressing operation followed by the sintering-infiltration step.

Made to close tolerances

Also made of reduced iron powder by Moraine Products is a ring for an automotive transmission. Hole and slot dimensions and spacing must be exact. Many machining and drilling operations would be required to make the part by conventional methods. Compacted of iron powder, the dimensional tolerances are held within critical specified limits and cost is reduced.

Merriman Brothers, Inc., Boston, Mass., produces metal powder helical gears within dimensional tolerances comparable to those held on conventional straight compacted parts. Tolerances of 0.001 in. on hole diameter, and $\pm$0.002 in. on outside and pitch diameters are not uncommon requirements.

Made of reduced iron powder supplied by Plastic Metals Div., The National Radiator Co., Johnstown, Pa., these gears are treated according to the job they will be called upon to do. Many are only compacted and sintered. Some are infiltrated with copper to increase toughness. Others are coined to increase density and strength. Gears to 2½ in. in diam, with helix angles to 27° can be made without undue die wear. Circular center holes introduce no problems, but those of an oblong shape require frequent refacing of press punches. Best solution here is to broach out-of-round hole shapes.



POWDER METALLURGY made machining unnecessary for this critical auto transmission ring.

ASSEMBLY COSTS were cut when this pepper mill cutter was redesigned as one powder part.

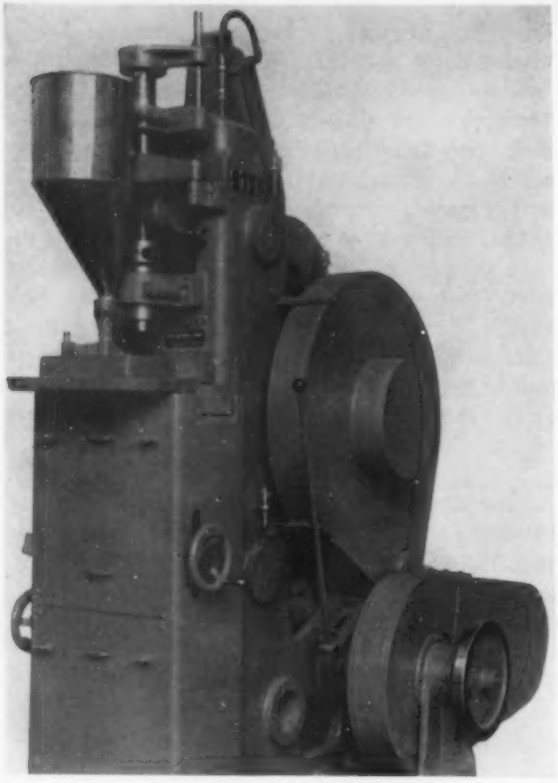
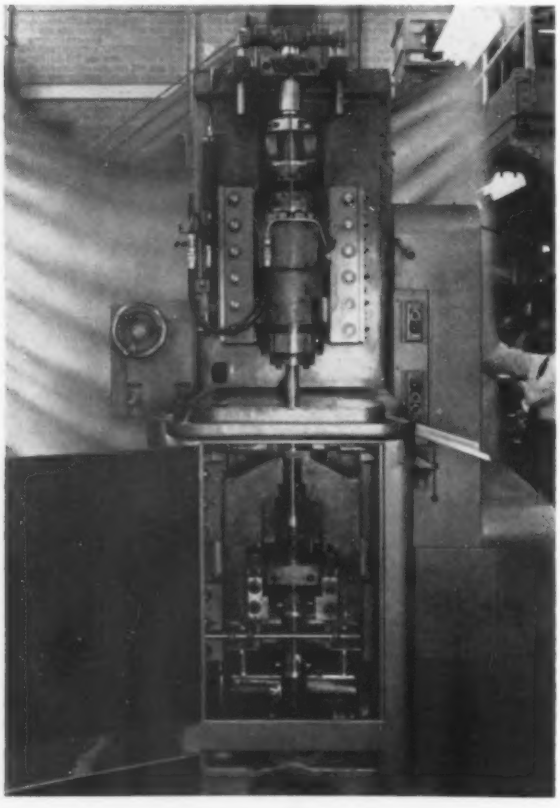


FIG. 1—Modern presses offer multiple motions. Press at top has one upper, two lower independent punch motions. Press, bottom, has two lower as well as two upper punch motions.

Larger, stronger, more accurate—

POWDER PRESS DESIGN Keeps Pace With Industry Needs

By J. L. Bonanno,
Chief Engineer
and R. B. Bouman,
Engineer
The Lionel Corp., Irvington, N. J.



◆ Larger, more complex metal powder parts, made to exacting specifications, are being produced with modern powder metal presses . . . Economy and speed in present production of high quality compacts is closely linked to development of press designs which especially meet the needs of the powder metal industry.

◆ Pressures as high as 75 tons per square inch are used in compacting many powder metal parts . . . Use of multiple motion presses has simplified tooling requirements and lowered tooling costs . . . Presses have been designed with closer, more accurate controls to speed setup and reduce press downtime . . . Dust control lenghtens press life.

◆ LARGE FLEXIBLE PRESSES specifically designed for compacting metal powders have opened the way to economical production of an increasingly wider variety of metal powder parts. Press manufacturers, using the accumulated experience of this growing industry and working with improved materials, have developed new presses to meet rapidly changing

industry demands. Results have been reflected in lower part costs and the ability to produce larger and more complex parts to exacting specifications. Tooling requirements have been simplified and production rates have been increased.

Carbides and better steels for compacting tools, both used more extensively in recent years, have permitted higher compacting pressures. This in turn created a need for larger, sturdier and more accurate presses. Whereas 30 tons per square inch was considered high some years ago, many parts today are pressed at 75 tons per square inch. The improved mechanical properties obtained through higher pressures and improved metal powders have opened new fields for larger parts once considered too exacting for powder metallurgy.

Standard presses now available vary from 1½ to 1500 tons. These range from simple single motion presses to complex five or six motion presses. Depth of fill and parts diameter have increased along with press tonnage. Presses having 18 in. fill and capable of making 12 in. diam pieces are now available as standard. In the higher tonnage range, presses are custom built for even greater diameters and depths of fill.

In the pill press era, part complexity depended greatly on the skill and ingenuity of the tool designer. As a result, many tools were complicated by self-contained springs, floating segments, air cylinders and other devices needed to produce the required action.

Introduction of multiple motion presses has probably accounted for a greater overall economy in the powder metal process than any other factor. Simpler, less expensive tools, requiring less setup and maintenance, can be used. Compacting costs are reduced because of less press downtime and increased production.

New presses simplified tooling

Good examples of presses providing multiple motions are shown in Fig. 1. The press at the top is arranged for simultaneous or nonsimultaneous compression with one upper and two lower independent punch motions. This press is also made with two independent upper punch motions and one lower punch with stationary core rod. The press shown below has two lower punch movements and a hydraulically operated second upper punch movement in addition to the standard mechanical upper punch movement. Positive compresion strokes, individually controlled, permit regulation of sizes on various pressing levels. Eection is accomplished by a separate ejection lever.

With multiple lower punches ejection is often accomplished by first leveling the punches in the die, then completing the ejection stroke. On this press the compact may be supported during the ejection stroke until the higher of the two lower punches is level with the top surface of the die. The other punch then raises the compact level with the top of the die to complete the ejection. More complex parts can thus be ejected without breakage.

The compression strokes for both lower punches can be applied so they will start their strokes from their individual fill positions. They travel at different rates to compensate for their different compressing strokes to arrive at their individual compression points simultaneously.

Uniform part density obtained

A high tonnage press combining mechanical and hydraulic motions is shown in Fig. 2. This press offers the advantages of triple hydraulic lower motion, floating die table, core rod and stripper. Uniform density throughout the part is obtainable with the hydraulically controlled floating die table and core rod rams. These recede against pressure which can be predetermined by simple, independent adjustments.

Die holder and core rod of another press, Fig. 3, float independently against pneumatic cushions. Positive adjustable stops control the travel of individual elements. An auxiliary stationary core rod can be mounted in the press in addition to the floating core rod.

Accuracy and rigidity of the powder metal press have been improved considerably by refinements in design and use of better materials. Improvement in tool life is noteworthy. As with most metal fabricating processes, compact quality depends to a great extent on the quality of the tools used to produce it. Very close fitting tools are useless if presses are not built accurately enough to maintain tool tolerances.

Unlike metal stamping tools whose accuracy is obtained by precision die sets, powder metallurgy tools depends for proper alignment solely on the accuracy of the press. Earlier presses were not inaccurate but were lacking in design features and material requirements to insure alignment after long operating periods. Powder metals are very abrasive and, because of their fitness, find their way into most of the operating parts of the press unless restrained by positive means.

The metal enclosures on the lower part of the press, Fig. 1, protect the lower mechanism from airborne powder. On some presses the working parts are submerged in oil in a dust-tight enclosure. Use of bellows-type dust boots and telescoping metallic sleeves on exposed wearing surfaces is quite common.

More generous use of larger bushings particularly in the four column type presses has resulted in more rigid and accurate guiding of the head in which the top punch is mounted.

Improved accuracy and wear, lower maintenance offered in modern compacting presses . . .

Shaft bearings have been increased in size and, with most of the moving parts, are now pressure lubricated. A pressure switch in the line insures that the proper oil pressure exists in the lubricating system before the press can be operated.

While steel and higher strength iron castings are still used extensively, welded frames are gaining in popularity. Many moving parts are now made from heat treated alloy steels for greater resistance to wear. Parts such as gibs, bearings, and slides, which wear in spite of premium materials are made easily replaceable. Die tables on many presses are now hardened to minimize wear due to the feed shoe and designed to take a portion of the load such as on flanged or shouldered parts.

In general the maximum speed of which mechanical presses are capable can seldom be fully utilized. Hydraulic presses, mainly because of their long stroke and slow transmittal of fluid, have always had a lower production rate. One manufacturer of hydraulic presses recently introduced a pressure multiplier unit which furnishes high compacting pressures with a minimum oil requirement thus increasing materially the speed of operation. This unit contains an integral valving system which converts from low to high pressure at the required time. The conversion is automatic and adjustable. Initial and auxiliary movements of the press, Fig. 4, are performed under low pressure and high pressure is introduced when required.

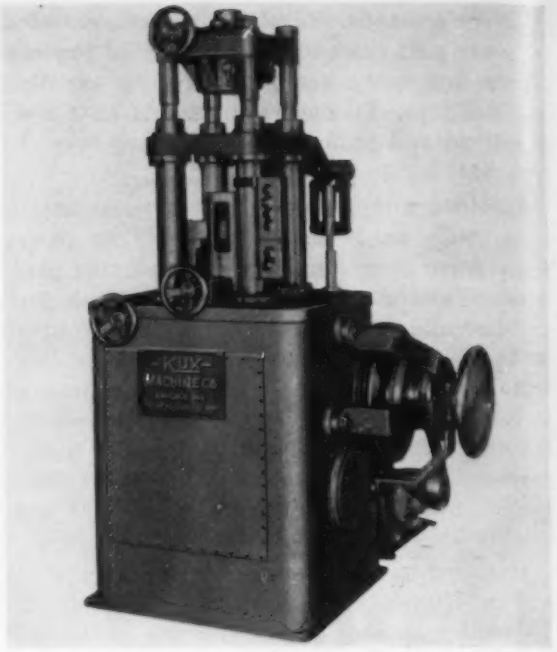


FIG. 4—Pressure multiplier on this hydraulic press materially speeds press operation.

Keeping pace with the mechanical improvements, multiple motion features, etc., has been the addition of much needed easily operated and controlled adjustment mechanisms. The setup of a powder metal press is time consuming, particularly on the more complex parts. Minute adjustments are required for weight,

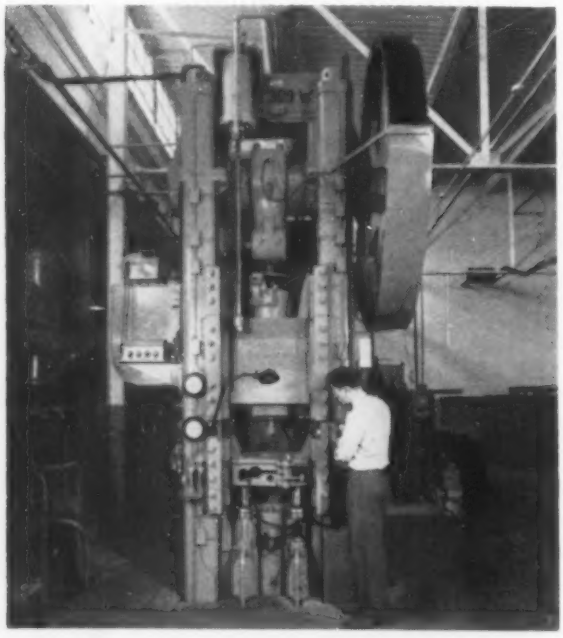


FIG. 2—Hydraulically controlled floating die table, core rod, stripper improve part density.

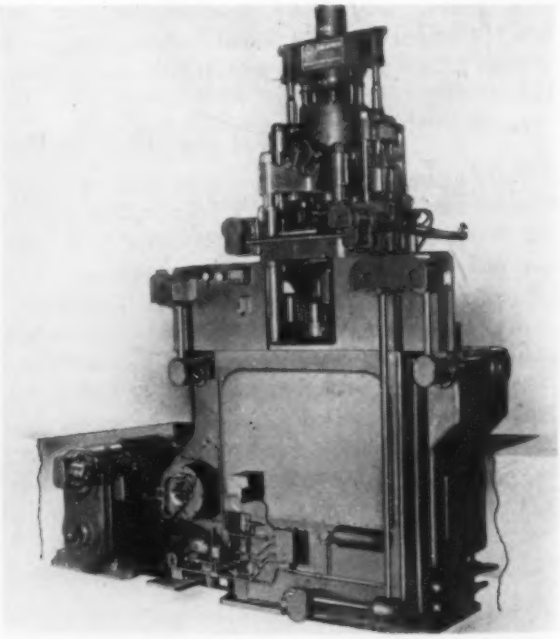


FIG. 3—Die holder and core rod on press float independently against pneumatic cushions.

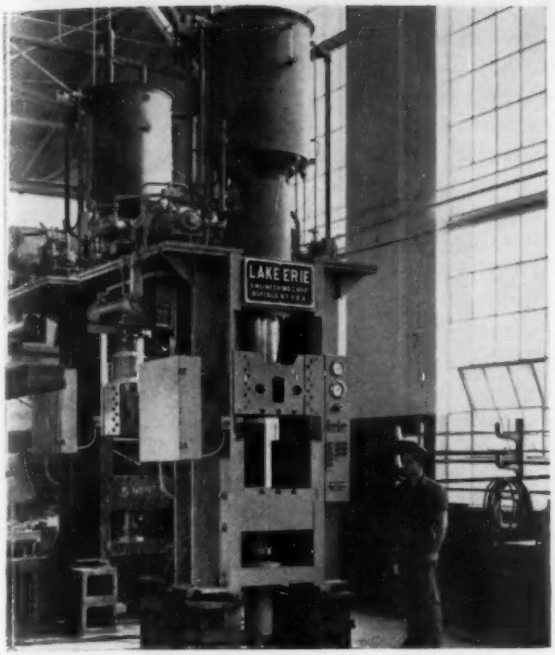


FIG. 5—Automatic adjustment mechanism helps control depth of fill, improve part density.

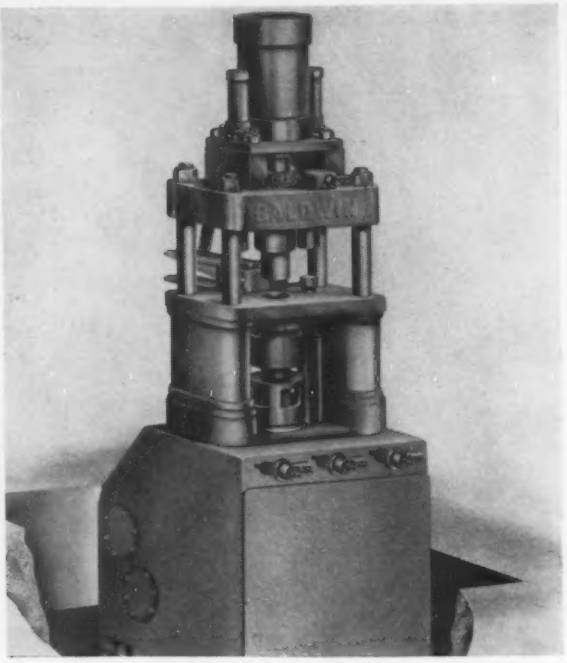


FIG. 6—Basically a mechanical press, head is a hydraulic cylinder. Piston contacts upper ram.

dimension and density control and most press manufacturers have devised improvements in recent models.

An automatic adjustment mechanism controls depth of fill on the press shown in Fig. 5. This control has been designed for two types of control mechanisms. One provides for a finished piece of maximum density at the rated tonnage while maintaining a close tolerance in size. The other provides for uniformly finished pieces of a desired density at a given tonnage.

For the former type, limit switch control at positive stops automatically increases or decreases the charge at each cycle until pieces of maximum density are continuously produced. If batches of powder vary, this control will automatically establish the charge for maximum density. The second type also controls the charge through limit switch and pressure switch mechanisms. For a given piece and material the compression versus the tonnage ratio must be determined. After this is determined, the pressure and limit switches are adjusted to open in a specific sequence. This provides the same density piece every time the depth of fill is close enough to make the pressure and limit switches function in the desired sequence. With a greater or lesser charge, the switch action occurs out of sequence and this changes the charge quantity accordingly until uniformly dense pieces are made at the set tonnage.

A new press with many capabilities is shown in Fig. 6. Basically it is a mechanical press. The head, however, mounted on the four columns, is actually a hydraulic cylinder with a piston in direct contact with the upper ram or top punch support. An adjusting mechanism allows regulation of the relative position of the top punch to the stroke of the head. The cylinder above the piston is filled with oil which is piped directly to an accumulator mounted on the head. Pressure in the head is obtained by charging the accumulator with air or nitrogen.

This type head overcomes one disadvantage of mechanical presses. It is usually difficult to know the pressure during any given cycle. The use of the hydraulic or floating head makes it possible to predetermine the pressure applied. Also, a slight dwell of pressure is obtained by adjusting the top punch. This feature, desirable in compacting light and fluffy materials, allows escape of air while compact is under pressure. Micrometer adjustments of top punch position, core and die float down stop positions, depth of fill and ejection stroke are included.

Two types of speed mechanism, shuttle and oscillating, are mainly used. Shuttle type feeders with stationary hoppers have recently been introduced. The feed shoe moves from a position directly under the hopper to a position over the die. The same head of material is transported over the die each time and the die is covered while the bottom punch is in the ejection or "up" position.

ACKNOWLEDGMENTS

The author thanks the Baldwin-Lima-Hamilton Corp., E. W. Bliss Co., Arthur Colton Co., Kux Machine Co., Lake Erie Eng. Co., and the F. J. Stokes Machine Co. for their cooperation in preparing this article.

Based on early principle—

HOT COINING Produces True Density in Powder Metal Parts

By G. J. Comstock, Vice President,
Easton Metal Powder Co., Inc., New York

◆ Alloy powders, in which each particle is of the desired composition, are being used to form powder metal parts of true density by hot coining . . . Preforms are first pressed at room temperature by conventional methods . . . Compacts are then passed through an atmosphere-controlled furnace to remove surface oxides from the powder particles.

◆ While at maximum heat, preforms are coined to 100-pct density, using a pressure of about 20 tons per sq in. . . . Steels of the 4600 series were the first to be hot coined to full density . . . Preliminary results with high-temperature alloys are encouraging . . . Parts hot coined from alloy powders are as good or better than cast parts of the same alloy.

◆ CONSOLIDATION of crudely screened particles of native copper by hammer forging them as hot plastic masses produced some of man's earliest tools. Hot-hammering natural iron particles to form tools followed this same pattern in logical sequence and presumably preceded all melting procedures.

In these crude, prehistoric, hot-work powder metallurgical operations, two things occurred. Metallic surfaces of these particles were "welded" or otherwise attached to adjacent particle surfaces. At the same time, molten or plastic gangues were squeezed out under the hammer blows, or were entrained in such small quantities as to be unobjectionable.

Early in the nineteenth century, a modified technique was applied to the production of ductile platinum. For the first time hot working was eliminated. Platinum sponge or powder was cold pressed and subsequently heated to about 2000° F. During this operation, particle-to-particle bonding took place so that the sintered pieces or compacts were sufficiently strong for further cold-working operations during which voids were eliminated and the true density of platinum was eventually attained.

A multiplicity of sintering or annealing heat treatments were interposed between these cold-densifying mechanical operations. Also, these heat treatments were calculated to continue the bonding effects of the first sintering operation until complete particle-to-particle adhesion was effected.

Wolaston gave a good account of how ductile platinum was fabricated by this method. It was recognized that maximum ductility and strength of platinum could not be attained until all porosity was eliminated by a number of alternate cold workings and heat treatments.

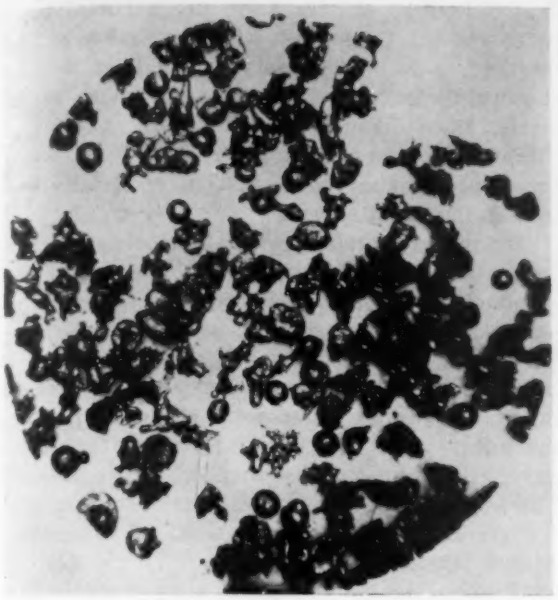
Powder metallurgy remained dormant for about 50 years. The Germans were probably the first to apply powder metallurgy techniques to the production of molybdenum at the turn of the century. Shortly thereafter, similar pressing and hot-forging (swaging) operations were used to produce ductile tungsten in this country.

Porosity is not tolerated

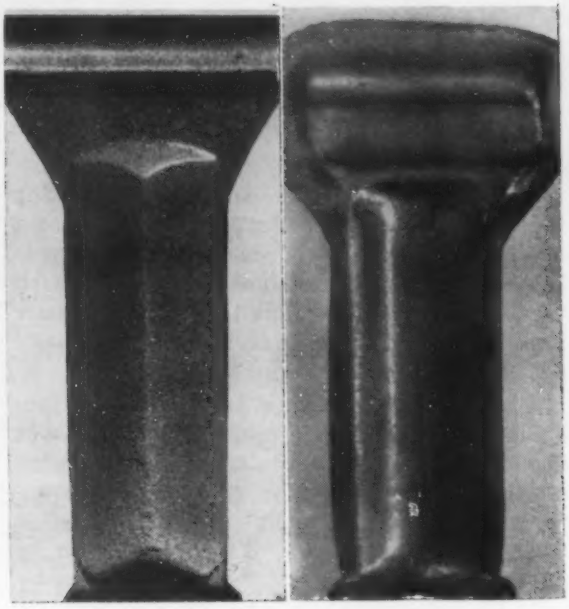
Three things may be regarded as significant in metal powder fabrication of the refractory metals, tungsten and molybdenum. First, these metals are worked from powder into solid bodies because it is not practical to melt them. Second, powder fabrication procedures are always continued until true density is obtained. Porosity is not tolerated. Third, both of these refractory metals must be hot worked to obtain their full density, strength and associated characteristics.

These metallic elements, when made from powders, possess great strength and ductility.

DR. COMSTOCK, a well-known metallurgical consultant, is also Professor of Powder Metallurgy at Stevens Institute of Technology.



EACH PARTICLE of this stainless steel powder is like a tiny pure ingot of desired composition.



PREFORM (left) is first pressed, then heated and hot coined (right) to 100-pct density.

However, they would be very unsatisfactory for their normal uses if they were not hot worked during manufacture. All products of powder metallurgy described thus far were made with the view of having maximum density and strength. These properties could only be obtained either by hot working, or by repeated cold deformation and sintering heat treatments.

Early in this century, a notable exception to these principles of powder metallurgy appeared. Hard cemented carbide materials were produced by cementation. These materials are made by a process which may be regarded as an unnatural deviation from the conventional practices for producing the strongest and densest materials from metal powders.

A series of favorable reactions

Tungsten carbide is hard, strong and metallic. Its refractory characteristic does not lend itself to melting and casting practice, nor does the tungsten-carbon constitutional diagram present any easy way for eliminating excess carbon from such melts.

When tungsten carbide is produced in the powder form mixed with powdered cobalt, pressed into tool forms and heated just below the melting point of cobalt, and well below the melting points of tungsten carbide, a series of most favorable reactions takes place. At sintering heat, the cobalt dissolves sufficient tungsten carbide to permit formation of a molten alloy and the capillarity of the compact distributes this alloy evenly throughout its mass.

At the same time, forces of surface tension aided by partial collapse of the undissolved tungsten carbide mass pull the compact together with sufficient force to exclude all voids which are observable at a magnification of 500X. Upon cooling, the excess tungsten carbide is redeposited on the undissolved carbide particles which are present in larger proportion, building them out in accordance with their crystal system and thereby minimizing the amount of cementing media required for a strong, dense, finished product.

Large, heavy components of hard cemented carbides are almost universally hot-pressed. At least in this sense, one order of these materials falls within the historic hot-working pattern which emerges from any thorough examination of applied powder metallurgy.

Metal powder products now being made, are mostly fabricated by methods which do not involve the original techniques of hot working, but rather by a partial application of the cold press and sintering practice. End products have either been porous by desire or were satisfactory substitute materials for specific applications. They were not fully representative of the physical properties which could have been developed.

Five reasons for changing

There are five excellent reasons for departing from this concept whenever circumstances indicate that by doing so special materials can be developed for special purposes. Powder metallurgy permits the combination of unalloyable metals. It permits the combination of metals and nonmetals. It permits fabrication of refractory metals which cannot be cast. It also permits the fabrication of metals under circumstances which produce unique structures, and eliminates machining operations.

Great skill and ingenuity have been employed in developing the greatest possible strength in metal powder forms and compacts which still contain numerous voids and discontinuities when compared with machined fusion products.

Hot worked alloy powder parts compare favorably with cast alloys of the same composition . . .

Impregnation with just enough lower melting brazing component to firmly attach adjacent unsintered particle surfaces and fill in voids has been one useful method. Another has been partial application of multiple high-pressure pressing and sintering techniques originally developed for platinum and iridium.

A new and interesting possibility for producing high-strength ferrous compacts without hot working is now in production development stages. Steel particles in the form of thin-walled, hollow spheres, annealed dead soft after their production by the "RZ" process, can be pressed to high density at room temperature by very low pressures, sintered and subjected to heat treatment. Physicals are of a high order not commonly obtainable by such simple and inexpensive operations.

Multiple pressing and sintering of these hollow steel spheres prior to heat treatment improve their physicals. Hot working them to theoretical densities would also give them their highest physical strength.

Serious work toward development of a process by which high-melting alloy powders could be mass produced began in Germany about 1936. It was inspired by the limitation of powder metallurgy as practiced with primary metallic powders. Stainless steels, Stellite and Nimonic alloys, high-temperature alloys and other high-melting complicated alloy systems could not possibly be produced with uniformity and precision of structure or composition form mixtures of their single components in powder form.

Hot coining improves particle bond

The mechanics of solid diffusion were obviously inadequate for such practical use. With the advent of alloy powders, each particle in effect being a small pure ingot of prescribed composition, it became only necessary to bond these particles to one another completely; also, true density had to be attained to produce the desired physicals. Hot working alloy powder compacts demonstrated again the primary principles required for the production of highest strength, high density materials made from powder.

Parts made from alloy powders by hot-working procedures have proven comparable in every way with cast alloys of the same composition. Sometimes they are better than the cast and worked compositions, but when fabricating operations have been correctly applied, they are at least as good.

Examples of the results of hot-coining steels and alloys in powder form are accumulating. Steels of the 4600 series were the first to be hot worked to 100-pct density. When heat treated according to normal practice for these materials, they display normal tensile strengths. Many high-temperature alloys have also undergone preliminary investigation with very encouraging results.

During experiments with the steel series, the response to heat treatment of the alloy powder products have in all cases equaled those of the same composition produced by melting, forging and machining. The experimental criteria for these steels has been the response to heat treatment, and test data compiled on microstructure, hardness, and the usual physical tests for strength, elongation and impact. In the case of the high-temperature alloys, stress rupture life at elevated temperatures was the standard means of evaluation.

Work on the hot coining of alloy powders has gone on for many years in the Industrial Powder Metallurgical Laboratory of Stevens Institute of Technology. It was only recently that results have become representative of the true possibilities of hot-working practice. The Michigan Powdered Metal Products Div., Allied Products Corp., has applied its mechanical and manufacturing knowledge to hot coining of metal powder parts on a production basis.

Hot coining uses sintering heat

The actual hot-working procedure, known as hot coining, is now becoming somewhat standardized. The hot-working practice generally applied to alloy powders follows conventional powder pressing and sintering procedures precisely except that the coining operation is done from the sintering heat and while the pieces are at maximum temperature, hence, the term hot coining.

Alloy powders produced by the disintegration of molten alloys are pressed into preforms at room temperature. Just enough pressure is used to hold them together for subsequent handling operations. These compacts are introduced into atmosphere-controlled furnaces where surface oxides are removed from the powder particles, carbon control is maintained, and the preforms are heated to a high forging or hot-coining temperature.

Pressures: 20 tons per sq in.

The hot, reduced, and still porous preforms are then removed from the furnace and hot coined to 100-pct density, and to approximately finished dimensions by the application of pressure of about 20 tons per sq in. During hot coining, all the elements necessary for good welding are present. These are: hot, clean metal surfaces in sliding contact with one another under pressure. Subsequent heat treatment develops the final desired physical attributes of the hot-coined components.

Through maintenance—

How to Get the Best Results from Sintering Furnaces

◆ Both preventive and remedial maintenance of sintering equipment helps to achieve consistently high work quality in making powdered metal parts . . . Three factors are most important in this respect—control of temperature and time in heating, control of protective atmosphere, and prevention of carbon or ash accumulation.

◆ Saturable-reactor control gives the greatest uniformity in temperature . . . Constant timing is obtainable with mesh-belt and roller-hearth type furnaces . . . Five different protective atmosphere gases are used for sintering . . . After selecting the proper one, its quality must be maintained within the furnace.

By H. M. Webber, Industrial Heating Application Engineer, General Electric Co., Schenectady

◆ SINTERING is just as important in making good powdered metal parts as is the character of the powder, composition of the mixture, and briquetting pressure. Assuming that proper sintering equipment is used, both preventive and remedial maintenance of such equipment will not only preserve the consistently high work quality, but will keep it operating continuously at peak performance and at low cost.

Factors in operation and maintenance of sintering furnace equipment which require the most attention for best results are control of temperature and time in the heating chamber, control of protective atmosphere throughout the entire heating and cooling cycle, and prevention or control of carbon or ash accumulation within the furnace.

SPACING of medium and large size parts assures uniform heating, better size control.

Uniformity of temperature is very important in sintering. This is particularly the case on bronze and other nonferrous parts which are highly sensitive to variations in temperature with respect to dimensions and physical properties.

Saturable-reactor control regulates the flow of current according to the demand, and gives the ultimate in temperature uniformity. Although on-off control is often adequate, it is sometimes possible to eliminate a subsequent sizing operation by holding unusually close dimensional tolerances on briquettes with saturable-reactor control.

Box-type furnaces used with batch loading are generally satisfactory for sintering when trays are short enough to utilize the flat temperature characteristic in the center of the chamber and avoid the drop-on at the ends. Trays must be stopped within the uniform heating zone for the same reason.

Editor's Note—Detailed information on symptoms and corrective measures, with respect to protective atmospheres, in the operation of sintering furnace equipment has been presented by the author and A. G. Hotchkiss in "Protective Atmospheres," Chapter 9, John Wiley and Sons, Inc., 1953.

Small box furnaces are sometimes operated semi-continuously, with small trays pushed against one another either manually or automatically. Semi-continuous box and continuous mesh-belt and roller-hearth-type furnaces afford the advantage of the same temperature cycle for all parts except those at the outer edges. Such parts, with greater exposed area, sometimes heat more quickly than the inner rows.

Manually-operated box furnaces lack control of the timing factor. Some furnaces have a timer and bell which signal the operator when a charge has been completed. For semi-continuous operation, the timer and bell are also used to call for a new tray.

Give improved speed control

Mesh-belt and roller-hearth type furnaces afford constant timing once the adjustable-speed drive is set. A customary drive mechanism consists of a motor, speed reducer, and an adjustable speed changer.

A motor with an electronic control is sometimes used to give constant speed regardless of load, and positive duplication of speed on resetting. Some continuous furnaces are equipped with a tachometer on the driving motor, calibrated in inches per minute to show conveyor speed.

Typical protective-atmosphere gases used for sintering are: hydrogen, dissociated ammonia, rich exothermic gas, purified rich exothermic gas, and dry or wet endothermic gas. The factors involved selecting the proper atmosphere gas tie-in with the appearance, physical properties, and cost of the sintered briquettes.

SMALL PARTS may be heated uniformly by placing them in a single layer on wire-mesh belt.

All five of these gases have properties which help to reduce surface oxides on powder particles and promote maximum fusion. They also prevent oxidation and thereby provide best frictional properties, good machinability, and good surface appearance.

Non-decarburizing atmospheres, such as purified rich exothermic gas and dry endothermic gas, are desirable for iron-graphite briquettes. They prevent decarburization in the surfaces or bodies of the parts which would result in soft wearing surfaces and low physical properties after heat treatment and render the parts useless.

Once the most suitable gas has been selected, proper quality of the protective atmosphere must be maintained within the furnace for best results from the standpoint of physical properties, discoloration and decarburization.

Nonferrous briquettes, such as copper and bronze, are susceptible to being oxidized throughout, and scaled or discolored by oxygen. They are not adversely affected by hydrogen, carbon monoxide and carbon.

Brass briquettes are susceptible to adverse effects by carbon dioxide as well as oxygen, sulphur and water vapor, due to selective attack on zinc. This impairs physical properties as well as appearance. When sintered in an open furnace, brass briquettes are generally treated only in pure dry hydrogen or dissociated ammonia.

Oxidation of briquettes made of iron or iron-graphite mixes is caused by oxygen, water vapor and carbon dioxide. If present in unsatisfactory proportions with respect to hydrogen and carbon monoxide, they can cause discoloration or scaling. Iron oxides are reduced by hydrogen, carbon monoxide and carbon. Decarburization is caused by oxygen, water vapor, and carbon dioxide. Carburization, on the other hand, is caused by carbon monoxide and hydrocarbons such as methane.

Contamination can be prevented

Contamination of the protective atmosphere in a sintering furnace can be prevented by observing simple precautions. Oxygen may come from air leakage into the furnace chamber through doors, stuffing boxes and gaskets. Air is also carried into the furnace with green briquettes. Other possible sources are the free oxygen in generated atmosphere gas and oxygen in atmosphere from cooling water used in direct-contact cooling systems.

Water vapor may be present due to oxides in briquettes entering the furnace, on powders before briquetting, or after briquetting awaiting the sintering operation. Hydrogen-reduced oxides form water vapor. Atmosphere gas intro-

duced into furnace; reformation of atmosphere gas under heat and leakage from water-jacketed members are other sources of water vapor.

Carbon dioxide may come from atmosphere gas as generated and from air leakage if the atmosphere gas contains carbon monoxide. Gas-flame curtains at the end doors and reformation of atmosphere gas under heat are other sources.

The presence of sulphur in the furnace may result from the fuel gas used in an atmosphere gas producer, from the air burned with fuel gas, lubricants in the work, and from brickwork and insulation.

Atmosphere gas as generated may contain carbon monoxide. Reaction of carbon or lubricants in the briquettes with water vapor or carbon dioxide in the atmosphere gas is another source of carbon monoxide.

Carbon, zinc oxide deposited

Methane may come from atmosphere gas as generated, carbon or lubricants in the briquettes reacting with hydrogen in the atmosphere gas, and from deliberate addition to atmosphere gas after generation.

Lubricants such as stearic acid, zinc stearate, and Sterotex start to distill out of the briquettes slightly above 600°F and are volatilized out after the briquettes are uniformly heated at 800°F. Heating to 1000° or 1200°F results in little, if any, improvement but it speeds up the action. Distillation of these volatiles produces vapors which can deposit carbon and zinc oxide within the heating or preheating chamber.

The many variables do not allow accurate prediction of troubles from lubricants in the high-heat chamber of a sintering furnace without a preheating chamber.

In non-decarburizing atmospheres, small amounts of volatiles may not cause difficulty, but large amounts may. This is because dry gases free from carbon dioxide do not react with carbon and thereby it is able to accumulte. Where lubricants cause difficulties in the high-heat chamber, addition of a preheating chamber may be a valuable asset.

Protection of heating equipment

Carbon, zinc, or zinc-oxide ash on any type of heating units or retorts cause muffling and improper transmission of heat. Carbon or lead from lead-copper mixes on the brickwork of a heating chamber can short circuit or ground electric heating units. Surface carbon, however, can be burned out with air at elevated temperatures.

While carbon or ash may not cause difficulties at operating temperatures of 1450° to 1600°F, they might cause damage to some types of units due to overheating, arcing, or carburizing at 2000° to 2050°F. Carbon or lead can impregnate furnace brickwork and little or no improvement results from burning it out. Lead vapors attack and corrode metallic heating units. Retorts are

Preheating chambers improve dimensional stability by aiding in control of expansion . . .

sometimes used to confine zinc or lead vapors and prevent contact with walls and heating units.

In some cases, moisture formed as a result of burning out might cause difficulty. If so, purging with nitrogen before and after burning out should prevent hydrogen combining with oxygen to form water vapor.

Preheating chambers are installed on many sintering furnaces, primarily to distill the lubricant from the briquettes before the work enters the high-temperature chamber. However, there are many sintering furnaces which have operated for years without preheaters and with no apparent need for them. Typical operating temperatures of preheaters are 1000° to 1200°F, although some are used successfully as low as 800°F and as high as 1500°F.

In some cases, preheating chambers afford a second benefit in the way of dimensional stability of the parts. Gradual heating allows hot gases, volatile lubricants and water vapor to escape gradually, resulting in less violent expansion of parts. This advantage becomes more pronounced as sintering temperatures and com-

FOUR-ZONE CONTROL provides accurate temperature regulation for continuous strip furnace.

Straightening of heat-resisting furnace parts is preferably done at 1900°F or above by pressing rather than by shock . . .

pacting pressures increase for a given mixture of powders and lubricant.

In maintenance of sintering furnace equipment, observance of certain precauctions will result in better continuity of service, better work quality and lower maintenance cost. Regardless of the type of furnace, it is good practice to open the furnace doors and burn the carbon out periodically with air at intervals of 1 to 4 weeks to prevent carbon from impregnating and permanently damaging the brickwork. Burning out usually takes 2 or 3 hours at 1300° to 1500°F and causes a marked rise in temperature of the walls and interior parts.

To avoid damage, furnace temperature should never be higher than 1500°F at the start of the burnout period. While burning out removes most of the carbon, it sometimes leaves a zinc oxide ash which also has to be cleaned out periodically.

Exit doors and door fronts should be kept tight by straightening, machining, or grinding to prevent infiltration of air and to force a free counter flow of atmosphere gas and carbonaceous vapors toward the entrance end. Proper adjustment of dampers and exhaust ducts helps to create this directional flow.

In repairing metallic heating units, the splice is made with equal or greater cross-section than that of the units to prevent overheating. Adjoining ends of ribbon units, for example, should be overlapped 3 in. or more, and welded only at the edges. The weld beads should start and end $\frac{1}{8}$ in. or more within the ends of the overlap to prevent burning the edges of the heating unit. A weld should never be made across the face of the ribbon.

Coated-electrode arc welding should be avoided because any remaining flux will subsequently attack the alloy. A carbon arc, without flux and filler, may be used to fuse the edges. A gas torch may also be used with a reducing flame and borax flux. The flux deposit is removed after welding by cracking with a hammer and dissolving with warm water.

Avoiding heat shock

Silicon-carbide bar-type heating units should never cool to below 1300°F. Keeping them hot and avoiding heat shock after standby periods will result in maximum bar life. Molybdenum units are brittle at room temperature and should be handled carefully during installation and when making electrical connections.

Retorts should be kept hot continuously to avoid heat shock, otherwise warping and cracking will result from cycling. Minimum temperatures of 1300° to 1400°F are recommended. Optimum results are obtained by holding the temperature constant during operating and standby periods.

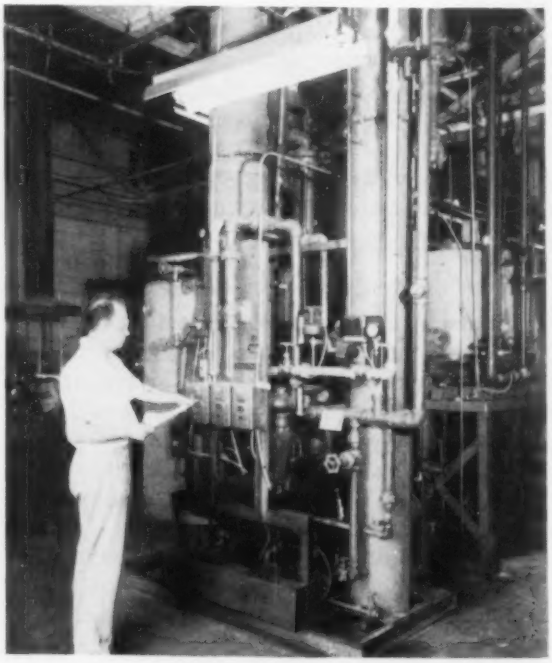
Cast-alloy hearth plates, rails and rolls should be examined occasionally. They may or may not withstand straightening operations depending on the age and condition of the alloy.

Straightening of heat-resisting alloy furnace parts and trays is preferably done at 1900°F or above, and pressing rather than shock treatment is best. Minor straightening can be done at room temperature. The metal should be worked either at 1900°F or at room temperature, but never in between.

A new wire-mesh belt should be run slowly through the cold furnace with slack tension while it is carefully inspected. All turned spirals should be flattened before operating tension is applied. The furnace is then heated gradually, during which time belt alignment is checked and pulleys adjusted to assure straight travel.

Proper belt care important

The belt is run for at least 10 hours at operating temperature under close supervision before applying the load. It should run in air up to about 1800°F until it is well oxidized before introducing protective atmosphere gas or applying load. When under load, belt tension is kept at the minimum value necessary to assure belt movement.



BRONZE AND IRON briquettes are often sintered in a furnace using purified rich exothermic gas from a gas producer of this type.

Rod-reinforced belts sometimes develop a camber in the rods in service. This will disappear if the belt is taken out and reversed carefully. Occasional reversal is permissible during its early life, but should be avoided after the wire becomes old and brittle.

Frequent inspection and adjustment of temperature-control equipment is highly important for sintering furnaces. Also, thermocouples and radiation units should be checked for accuracy. Practically all changes in thermocouples cause a decrease in millivoltage output and furnace temperature will be higher than shown by the instrument. This may affect dimensions and physical properties of briquettes, and shorten life of furnace parts.

Contact tips need watching

Contact tips on power control panels should be inspected regularly. If prominent beads form on their surfaces due to severe arcing, dress the contact faces with a fine file. Contactors on the primary sides of power transformers, where high inrush currents may occur, should be watched carefully.

Clean burner tips for gas-flame curtains assure effectiveness of the curtains across the openings. Pilot tips should also be clean and positioned so that flames will not be blown out when doors are opened.

Bearings on roller-hearth furnaces should be greased adequately, but not too much, to prevent carbonizing and jamming.

A water-jacketed cooling chamber should never be operated under heat without water. This will avoid distortion and cracking. Check gasketed joints, fan shafts and stuffing boxes periodically for tightness.

All types of gas producers benefit by periodic burning out of carbon. Once a week is generally adequate, but operating conditions may dictate more or less frequent attention. If the requirement is too frequent, increasing the input air-gas operating ratio may help if results on briquettes permit.

Need of burning out is generally indicated by a dropping off of the output-gas flow. In the endothermic type producer or ammonia dissociator, it is indicated by an increasing pressure differential through the retort. Carbon is deposited on catalyst due to incomplete reactions of hydrocarbon gases with air, or from oil in ammonia accidentally present in bottles.

In burning out the hot producer, overheating should be avoided by first shutting off the fuel gas or ammonia input. The temperature is then dropped to 1300° to 1500°F and half or less of the normal air flow is circulated, or half as much air as the rated output of dissociated ammonia, through the reaction chamber. Regulate or stop the flow of air if necessary to avoid overheating.

General maintenance also includes cleaning the air filter about every 2 weeks, removing fire checks and blowing out deposits occasionally, cleaning flowmeter tubes, changing catalyst periodically, cleaning out atmosphere-gas coolers occasionally, and checking for leaks. When replacing pump seals on a purified exothermic gas producer, iron seals must be used, since iron is unattacked by monoethanolamine.

SINTERING BRONZE and iron briquettes in purified rich exothermic gas. Mesh belt furnace has a 3-ft long preheating chamber with sheath-wire heating units, and an 8-ft long high-heat chamber with ribbon units. Belt is 20 in. wide, door opening 12 in. high.

Depends on part density—

Proper Plating Techniques Give Good Surface Finishes

◆ Plating on powder metal parts can be done satisfactorily by use of proper techniques . . . Selection of the plating method depends to a great extent on surface porosity of the part . . . If its density is more than 95 pct of theoretical, plating will be similar to that for wrought, forged or cast parts.

◆ Closing of surface voids by impregnation, mechanical working on heat treatment is usually necessary before plating parts having density of 85 to 95 pct of theoretical . . . A number of pretreating methods have been developed for this purpose . . . Some porous parts can be plated by special techniques without closing the pores.

By **H. H. Hausner,** Manager and **H. B. Michaelson,** Head of Technical Information
Atomic Engineering Div. Sylvania Electric Products, Inc., Bayside, N. Y.

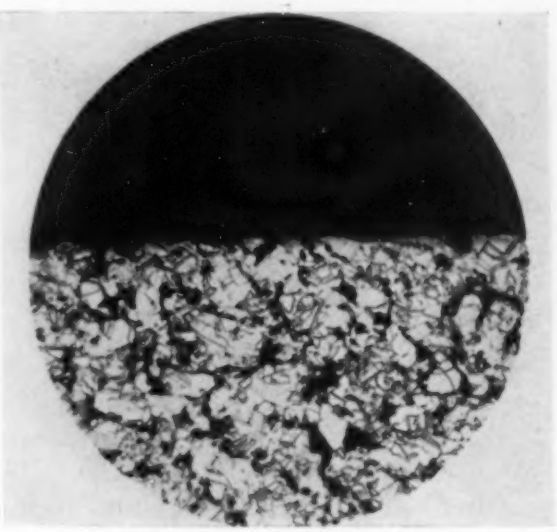
◆ INHERENT POROSITY of powder metal parts prevents electroplating by conventional methods but porous pieces can be plated satisfactorily by various techniques developed in recent years. Sintered powder parts generally have a velvety appearance, but suitable surface preparation and plating can give them high luster or different color for a decorative finish.

It is also possible to improve the corrosion resistance of either low or high-porosity sintered parts with platings of chromium, nickel, cadmium, zinc, or other metals. Copper or silver surfaces can be applied for low electrical resistance, and tin plate for solderability.

Wear and abrasion resistance of sintered articles are also improved by the selection of proper plating finishes. Ferrous powder parts, frequently given a black oxidizing treatment which is somewhat embrittling, have a more pleasing appearance and improve durability when electroplated.

The particular method for plating a powder part depends on the degree of surface porosity of the metal powder compact. If its density is more than 95 pct of theoretical, the few isolated pores on its surface have little effect on the plating process, and the job of plating is usually no different from that for a wrought, forged or cast part. Likewise, a heavily coined powder part, in which the surface pores have been closed by coining pressure, may then be electroplated.

Parts of medium porosity in the approximate range of 85 to 95 pct of theoretical density are usually plated only after the surface voids are closed by some type of impregnation, mechanical working or heat treatment. The best method



CROSS-SECTION of as-sintered 85-15 brass powder part (250X) shows surface pores, which if not sealed, leave areas open to corrosion.

of closing surface pores depends on the brittleness of the compacted powder.

Other types of sintered products may have densities as low as 40 pct of theoretical. In this category are the highly porous bronze oil-containing bearings and sintered steel filters. Although such parts usually do not require plating, special plating methods can protect pores from corrosive fluids or atmospheres.

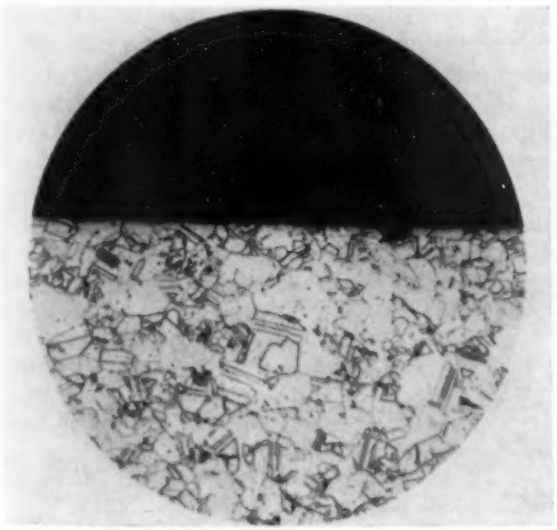
Entrapped fluids a problem

Surface porosity causes several kinds of difficulties in electroplating sintered materials. Ordinarily, attempts to seal the microscopic voids in the surface by conventional techniques will not give a uniform adherent deposit. Exposed pores may then leave areas open to corrosion. A porous surface also has low electrical conductivity and requires high current density for efficient plating.

Another source of difficulty is drag-out because transfer of porous powder compacts from one plating tank to another can result in harmful contamination. Careful rinsing and neutralization are necessary to maintain the purity of the cleaning, pickling and plating solutions.

One of the main troubles with porous articles is spotting out. Interconnecting pores in the powder compact tend to trap and retain oil, acids and salts from the electrolyte. During the plating cycles, the parts act as a sponge and may soak up liquids until the interior pores are filled. Unless these liquids are removed or neutralized, internal corrosion may begin within a few days. Eventually, the material exudes from the surface pores, resulting in discoloration or flaking of the plate.

Alkaline electrolytes, in particular, tend to undergo chemical reactions in the pores and to swell and flow outward. Acid electrolytes generally require higher current densities than the alkaline types. Inert metals such as nickel or tin, which do not form oxides or sulfides readily, are not generally susceptible to spotting out when plated on porous metals. Copper, brass, cadmium and gold are sensitive to this kind of failure.



AS-COINED 85-15 brass structure (250X) is dense and its surface is amenable to electroplating by methods used for forged, cast parts.

Remedies for these difficulties involve either thoroughly removing the entrapped corrosive liquids by dewatering agents, or closing or filling the surface pores before electroplating. Methods used for highly porous materials may fill the internal pores as well as those at the surface with solid impregnants.

Pores in sintered ferrous products can be closed by impregnation with molten metals such as copper, lead or tin.[1] This treatment increases density, static and dynamic strength, and corrosion resistance. Copper is a particularly good infiltrant because it provides a highly conducting flash plate for subsequent deposition of nickel or chromium In many cases, the infiltration process may be combined with the sintering operation by the use of mixed powders.

Thermosetting polyester styrene is also used for impregnation of sinterings.[2] The porous parts are degreased if necessary, prebaked to remove moisture from the pores, and impregnated with the compound under vacuum and pressure to attain complete pore pentration. A special emulsifying cleaning bath removes the extraneous impregnant from blind taps and threads. The parts are then cured at 250° to 300°F to polymerize the impregnant in the voids.

The process is said to be equally satisfactory for ferrous and nonferrous metals. The styrene is usable at temperatures up to 350° or 400°F. Resultant parts are claimed to be pressure tight to over 5000 psi, and free from spotting out.

Impregnate with resins, metal fillers

Impregnation of powder parts has been done with resins for high corrosion resistance.[3] The sealants include a sodium silicate type, with or without semicolloidal metal fillers. Although sodium silicate shrinks on baking, it tolerates high temperatures and pressures. Among these resins were thermosetting compounds consisting of resin and resin-oil combinations such as styrene with linseed oil or dehydrated castor oil.

Methods of impregnation include the pressure vessel which has the disadvantage of compressing some air into the microscopic holes of the powder compact. With the internal pressure method for parts having interconnecting pores, the compact is sealed off except for a single port into which the impregnant is introduced under pressure. Pores and capillaries are thus filled from the inside outward.

In a reverse arrangement by vacuum sealing, the compact is submerged in the sealant which is pulled by vacuum through the walls from the outside to the inside. In addition, a batch process can be used in which pressures of 50 to 100

Impregnating materials can be used to seal powder metal parts prior to electroplating . . .

psi assist the capillary action to draw the sealant into the voids of the compact.

Temperatures of 150° to 200°F are used during impregnation with an immersion time of 2 to 6 hours The parts are then drained, washed in hot water and heated to about 212°F for 1 to 2 hours. Impregnated powdered iron compacts plated with cadmium were claimed to withstand 300 to 700 hours of salt spray, depending on the plating sequence used.

Another method of electroplating sintered materials is used particularly where the density is below 95 pct of theoretical. The surface of the sintering is first cleaned with a blast of vapor which contains an abrasive material having a particle size small enough to permit entry into the surface pores. The article is subsequently cleaned by wiping or otherwise removing the volatile solvent. After drying, the part is plated.

Impregnation with silicones prevents the flow of plating solution into the pores. One method coats the porous iron surfaces with a thin water-repellent film.[4] The compact is heated in air to 400°F, quenched in a 4-pct solution of Dow-Corning Type 200 silicone in perchloroethylene and baked for ½ to 2 hours. After an acid pickle, usual plating procedures can be used, preferably with alkaline baths.

Volatilize residual salts

Heat treatments have been used to volatilize residual cleaning and plating salts which would otherwise be leached by repeated washings.[5] Those salts which would not be volatile at the heat-treating temperature were first converted to volatile compounds by chemical means. If driving off these salts from the pores should stain the surface, it can be polished or cleaned according to the required finish.

Other methods have also been used for volatilizing residual plating salts out of the pores.[6] One of these is used for racked parts having sufficient green strength to be handled. The unsintered compact is first electroplated, then washed, and given a neutralizing acid dip if required. This is followed by the usual sintering practice.

In the later stages of sintering after the gases have escaped through the surface pores, the voids gradually disappear because of the sintering action which seals the surface. Some diffusion of the plating metal into the surface of the compact may also take place, accompanied by improved adhesion of the electroplate.

A second method is similar to the first except that the green compact is briefly presintered to increase its handling strength before plating. This presintering procedure can thus be used for both rack and barrel plating. Alloy surfaces can be obtained, for example, by plating with layers of nickel and copper, or with copper and tin, and then giving sufficient heat treatments to diffuse these surface layers. The respective coatings will then consist of Monel and bronze.

Buff brass to improve surface

Although coining, rolling or repressing can eliminate surface porosity, these methods of mechanical working are generally too costly when used merely to prepare the surface of a porous part for plating. Brass sinterings, however, may be buffed to reduce surface porosity before plating.[7]

Greaseless polishing compounds were used for an initial mild polish of the 85-pct Cu-15-pct Zn compact. This was followed by buffing with a very fine dry lime abrasive compound for maximum luster. Copper was then plated on the polished surface to a thickness of about 1 mil, subsequently buffed, and plated successively with nickel and chromium.

Nickel-chromium plating can also be done without the copper coat if the quality of the brass compact permits, or if surface perfection is not required for the finished part Between buffing and plating, drag-out is minimized by use of a weak neutralizing dip followed by hot and cold rinsing. Mechanical working of the surfaces prevented spotting out.

In another method for preparing brass parts for plating, the sintered parts are first machined to specifications, then subjected to thorough solvent cleaning to remove oil.[8] After light buffing, they are cleaned, rinsed and plated with copper to a minimum of 0.0003 in. to increase electrical conductivity of the surface. The base coat of copper, also buffed, promoted uniform distribution and adhesion of subsequent nickel and chromium platings.

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High-Density Processing Widens Field for Powdered Metals

By W. J. Doelker, Vice President of Engineering, Pow-Met Industries, Inc., Dayton

◆ Small complex powdered metal parts are being made with strength characteristics, tolerances and surface finishes equal to or better than those of steel parts . . . Two major obstacles, among others, had to be overcome—obtaining a powder of extremely high purity, uniform in composition and quality, and with proper particle size and shape; and the most suitable die material to withstand the high pressures and abrasion.

◆ Physical characteristics of parts can be varied to suit service conditions by varying their density and method of production . . . Complex shapes are reproduced exactly and consistently without need of further processing . . . In many cases, high-density powdered metal parts have replaced parts of heat-treated alloy steels and have outperformed them . . . They are also used for heavy-duty cams, gears, bearing races and similar applications.

◆ POWDERED METAL PARTS having the characteristics of steel parts are now being made on a production basis. The process, which enables high-density parts to be made from electrolytic iron powder without the addition of other materials to the base metal, has opened a field of application potentially greater than that for low-density parts.

The process was developed by the National Cash Register Co., Dayton. The research program was prompted by the need for high strength parts having a high degree of uniformity, close dimensional tolerances and very good surface finishes. The powdered metal process not only offered these possibilities, but showed promise of decreasing production costs of steel parts.

Since the development of the high-density process, Pow-Met Industries, Inc., Dayton, has undertaken commercial production of parts by this process. Even though some of these parts have been in use only a short time, they have already proved to be superior in accuracy, uniformity and strength to the parts previously used.

The process offers a variety of physical characteristics to suit the service conditions of the part. These characteristics are obtained by varying the density, heat treatment, and method of production of the part.

Dimensional tolerances vary with the processing employed. Double pressed parts are held to closer tolerances than those which are single pressed. Also, due to the burnishing effect of double pressing, better surface finishes are obtained.

Parts made under two different sets of conditions have shown compressive strengths in excess of 540,000 psi. This compares favorably with a heat-treated AISI 52100 steel which is normally used in ball and roller bearings. Powdered metals having these characteristics are used for heavy-duty cams, bearing races and other parts requiring similar properties.

In many cases, high-density powdered metal parts are replacing heat-treated alloy steels and outperforming them in accelerated life tests. This is particularly so with gears and cams where, in addition to strength, important factors such as accuracy, surface finish and shape are involved.

Gears meet AGMA Class 3

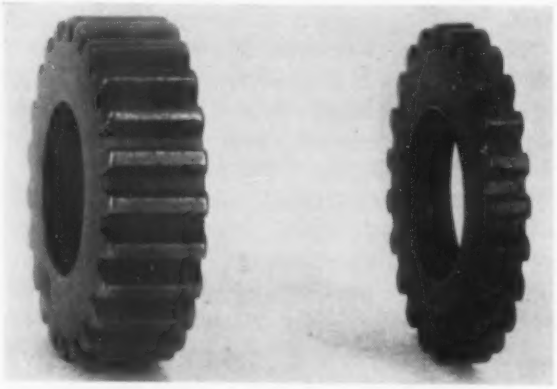
Gears made by the high-density process are almost perfect. True involute tooth forms can be made. Dimensional tolerances for inside diameter, pitch diameter, eccentricity, composite error and tooth location can be held to AGMA Class 3 standards or better.

Parts requiring a tensile strength of 55,000 to 60,000 psi, yield strength of 45,000 to 50,000 psi, and elongation of 8 to 10 pct were held in production within 0.0002-in. tolerance on a 1½-in. diam and within 0.0001 in. on any one part. Although these tolerances are not commonplace, they exemplify the degree of dimensional control that can be obtained. On the

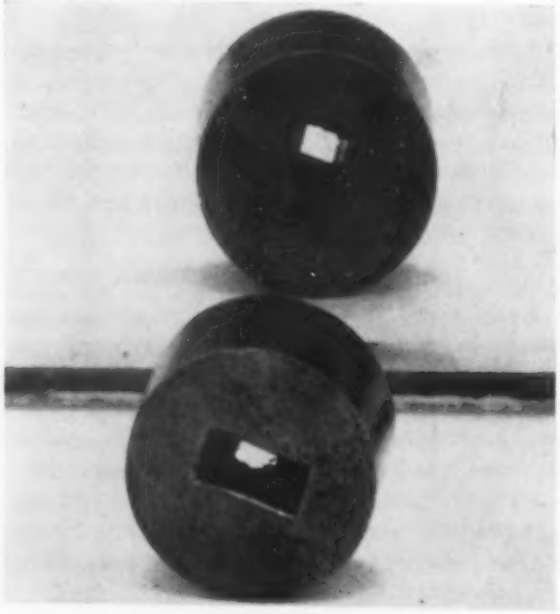
same parts, surface finish was held to 10 microinches which is comparable to many lapped surfaces.

Close tolerance can be held on practically all radial dimensions. Generally, these dimensions are held within ± 0.1 pct, and in some cases dimensions have been held within ± 0.001 in. on a 3-in. diam.

Tolerance limits on thickness must of necessity be greater. These dimensions depend on punch movement and powder fill, hence they cannot be held as closely as those controlled by the die. In single-pressed parts up to 0.100 in. thick, the tolerance is usually ± 0.0015 in. Closer tolerance can be held by coining.



PLANETARY GEARS made by high-density process have longer life, are freer running and have closer tolerances than gears they replaced.



SMALL COUPLING was double pressed, double sintered and heat treated to stand high loads at high speeds. Clutch cuts are at right angles.

Concentricity can be held within ± 0.001 in. without too much difficulty. These dimensions are controlled mainly by the accuracy of the die.

Maintaining accuracy in the distance between holes is sometimes difficult, particularly where the holes are 3/16 in. in diam or smaller. This problem is caused mainly by fill conditions which result in more powder being packed on one side of the core rod than on the other. In pressing, more pressure develops on the side which is more densely packed, causing misalignment of the rod. Where hole sizes are greater than 3/16 in. diam, dimensions can be held to ± 0.001 in.

Dimensional changes due to heat treating have no practical effect on the parts. This may be attributed to the complete freedom from internal stress resulting from annealing prior to heat treating.

The amount of fill for each part is of the utmost importance because it controls both dimensions and density. Weight of powder must be maintained within 1 pct or less if the desired characteristics are to be obtained.

Due to the accurate controls which must be maintained throughout every phase of production, the rate of production for the initial pressing operation is slower than that used for making low-density parts. Small presses can be operated at 30 to 40 strokes per minute while presses of about 20-ton capacity can be operated at 22 to 35 strokes per minute. Heavy press operations are done at 15 to 25 strokes per minute.

Stronger parts may be made

The process has made it possible to economically produce parts which by conventional manufacturing methods are difficult or expensive to make. It no longer limits the powdered metal industry to production of parts having the characteristics and strengths of cast iron. Low alloy and carbon steel parts can be replaced by powdered metal parts without sacrificing strength. In addition, such parts will have better quality, uniformity, surface finish and lower cost.

Although the process has many desirable features, it has certain limitations. Foremost among these is the higher cost of parts made by this method as compared to those made by conventional powdered metal processes. This is due primarily to the use of more expensive raw materials and the higher cost of processing.

Tooling is a greater problem since higher pressures are involved. Tools must be stronger and made more accurately. Carbide dies are practically compulsory to obtain the necessary

POWDER PROPERTIES REQUIRED

Extremely high purity to obtain maximum strength and to maintain very close tolerances.

Sharp or irregular particle shape for better control over fill characteristics, compressibility and green strength.

Narrow range of particle size distribution for better fill characteristics, greater density, and closer control of size.

Minimum hydrogen loss to indicate oxide content. Too much oxide causes dimensional variations and lower density.

Close limits on flowability for better control over amount of powder used for each part, and hence better control over size and density.

Minimum green density of 6.50 g per cc, using a powder blend with 1 pct zinc stearate and pressed at 60,000 psi for good compressibility.

Green strength of 1600 psi minimum as determined by standard transverse rupture test, or 6 pct maximum loss by standard rattle test, to prevent breakage of parts.

Utmost uniformity between powder lots for accurate reproducibility of parts.

Minimum distortion in sintering since swaging or coining decreases strength, and holding dimensional tolerances would be difficult or impossible.

strength. They are also required for optimum dimensional accuracy and surface finish.

Die life with carbide has been high. Less than 0.0002 in. of wear has occurred after more than 9 million press strokes. Sections of dies have been replaced because of chipping.

Another limitation is the narrower range in the types of parts that can be produced. This is due to the fact that each part is pressed to a maximum value to eliminate variations in density. Metal powders do not flow as does a plastic or fluid medium. Therefore, the exact amount of material must be placed in the proper position to produce the desired density.

LIFE TEST favored this gear 3 to 1 over heat treated alloy steel gear it replaced. Teeth have true involute form and smooth surfaces.

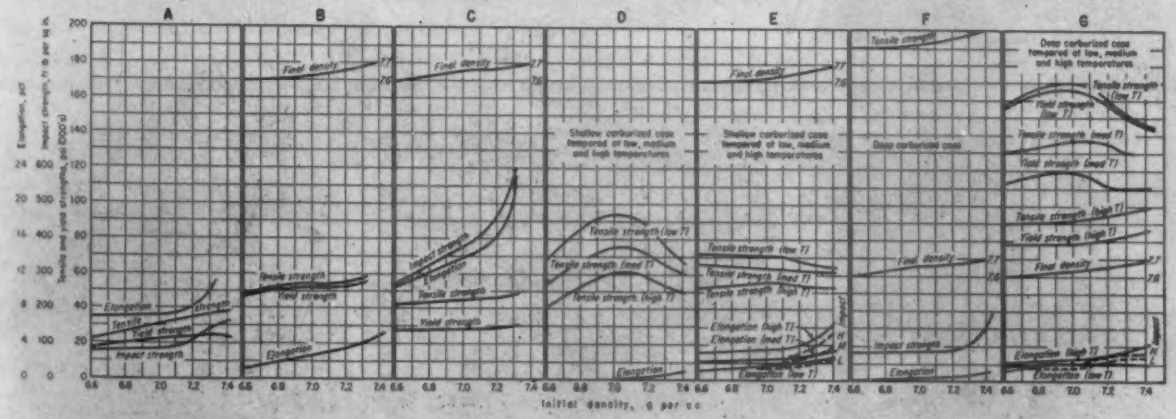
These factors limit the number of steps or levels in the direction in which the part is pressed. In low-density parts, variations in density are permissible and therefore they may have a greater number of these steps or levels.

The length of parts and the ratio of wall thickness to length are also more limited in the high-density field than in low-density applications. Higher pressures cause greater wall friction, make it impossible to press longer, thinner parts to desired density. Parts thin in direction of pressing are more practical because greater strength can be developed.

ACKNOWLEDGMENTS

The author wants to thank C. R. Kemper, Pres. and C. G. Dudis, Secretary-Treasurer of Pow-Met Industries, Inc., for their assistance in preparing this article.

PROCESSING DETERMINES POWDER METAL PARTS PROPERTIES



PROCESSING: A, pressed, sintered; B, coined, sized; C, double pressed, double sintered; D, as A, heat treated; E, as C, slightly carburized, tempered; F, as C, deep carburized, fully hardened; G, as F, deep carburized case tempered at low, medium and high temperatures.

CASE HISTORIES of Powdered Metal Parts

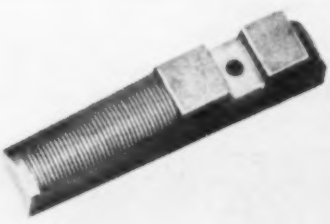
The large volume of parts now being produced by powder metallurgy techniques is a good indication of the growing importance of this fabricating method. Of course, no one process is a cure-all for high production costs. However, in many cases powder metallurgy can achieve substantial production savings. Following are a few of the numerous powdered metal parts now being successfully produced.

Cam

Hardened cam with counterbore and splined inside diameter is an excellent example of how powder metallurgy permits production of critical parts that offer improved performance at low cost. Optimum hardness is required to resist wear so parts are surface hardened. *Data courtesy: Moraine Products Div., General Motors Corp.*

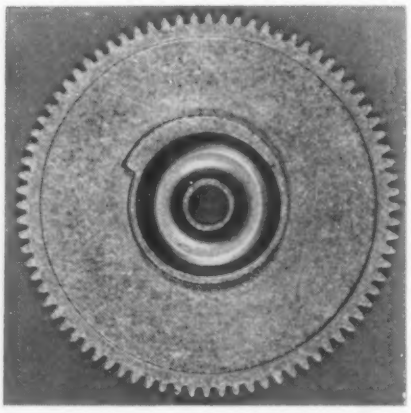
Gun Sight

Less than 1 pct iron and manganese combined with powdered iron converts these metals during sintering to an alloy steel in making a gun sight. The parts are produced at rate of 1200 per hour. *Data courtesy: F. J. Stokes Machine Co.*



Electrical Cores

Because powdered iron, mixed with resin binders, gives just the right high-frequency characteristics, such cores have become essential elements in radio and TV equipment. *Data courtesy: Henry L. Crowley Co., Inc.*

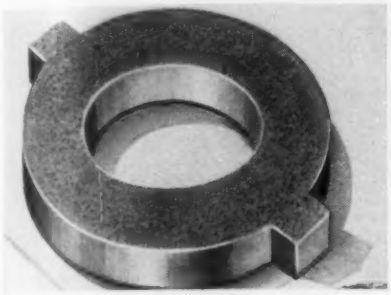


Cam-Gear

This cam-gear combination used in a calendar clock makes one complete revolution in 24 hours. A lever and spring assembly rides the cam until a fixed time when it drops from the high side to the low, automatically changing the day and date. Dimensions on changing cam contour are held to minus 0.001 in. *Data courtesy: Lux Clock Mfg. Co.*

Seal

Cost of this seal when made by powder metallurgy methods was reduced 90 pct. These savings came from elimination of intricate set-up work and machining operations. Savings in raw material alone amounted to 76 pct. In addition, surface finish was improved at no additional cost. *Data courtesy: Superior Carbon Products, Inc.*

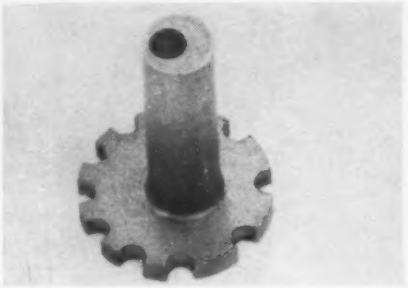


Break-Cam

Complicated break-cam was made by Metallwerk Plansee, Reutte/ Tyrol, Austria. The die for compacting the metal powders included a rotating top plunger for pressing the cam part. Powder metallurgy permitted considerable cost reduction by material saving and by eliminating practically all machining operations. No sizing was needed. *Data courtesy: Sylvania Electric Products, Inc.*

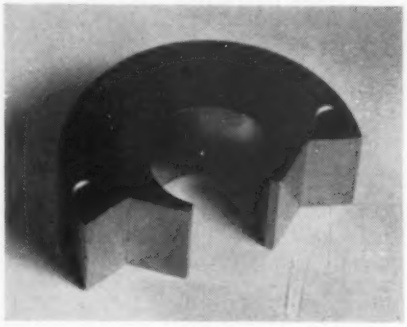
Adjusting Pin

Nickel powder adjusting pin is shaped as shown without further machining. The off-set hole is in direct relationship with the flange serrations. The part was formerly made by a precision casting process. Nickel is used for its anti-corrosion resistance. *Data courtesy: Asco Sintering Co.*



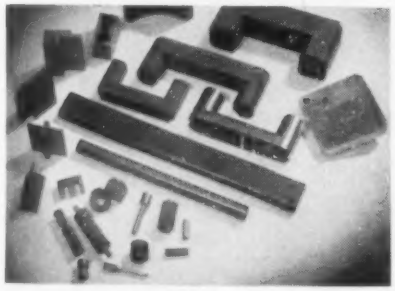
Drive Gear

This drive gear is used in a home ice cream freezer machine. The complicated, internally splined hub engages the shaft to which the paddles for churning the ice cream are attached. A machining operation is required for the oil groove. *Data courtesy: Powdered Metal Products Div., The Yale & Towne Mfg. Co.*



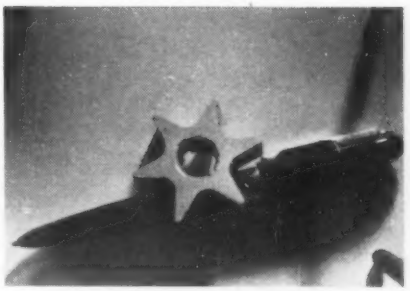
Pole Piece

Pole piece is coined to a minimum density of 90 pct. The large hole is maintained within a tolerance of ±0.0005 in. with a mirror finish on all vertical surfaces. Final operation consists of annealing to relieve cold working stresses. *Data courtesy: American Sinterings Div., Engineered Plastics, Inc.*



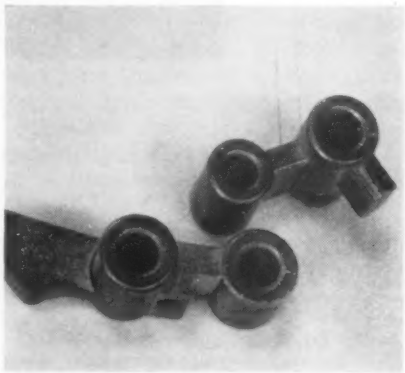
Chain Saw Sprocket

A sprocket pressed from electrolytic iron powder and used in a chain saw, gives performance equal to that of steel. In service, this Oilite part operates under severe shock and abrasive conditions. Amplex Div., Chrysler Corp. *Data courtesy: A. Johnson & Co., Inc.*



Cam

Surface of this special cam, used in the locking mechanisms of loading ramps for airplanes, is completely formed in the compacting operation. Development of cam surface by powder metallurgy methods saves an expensive machining job. The part is formed as shown at a high rate of production. Only machining is drilling of holes. *Data courtesy: Asco Sintering Co.*



Link Arms

Oil-impregnated bronze idler link arms shown here are used in variable speed record player mechanisms. Parts have been fabricated via powder metallurgy because the intricate design would make machining quite costly. The part acts as a bearing at both holes, one with a revolving shaft, one an oscillating shaft. Alliance Mfg. Co. *Data: Keystone Carbon Co.*

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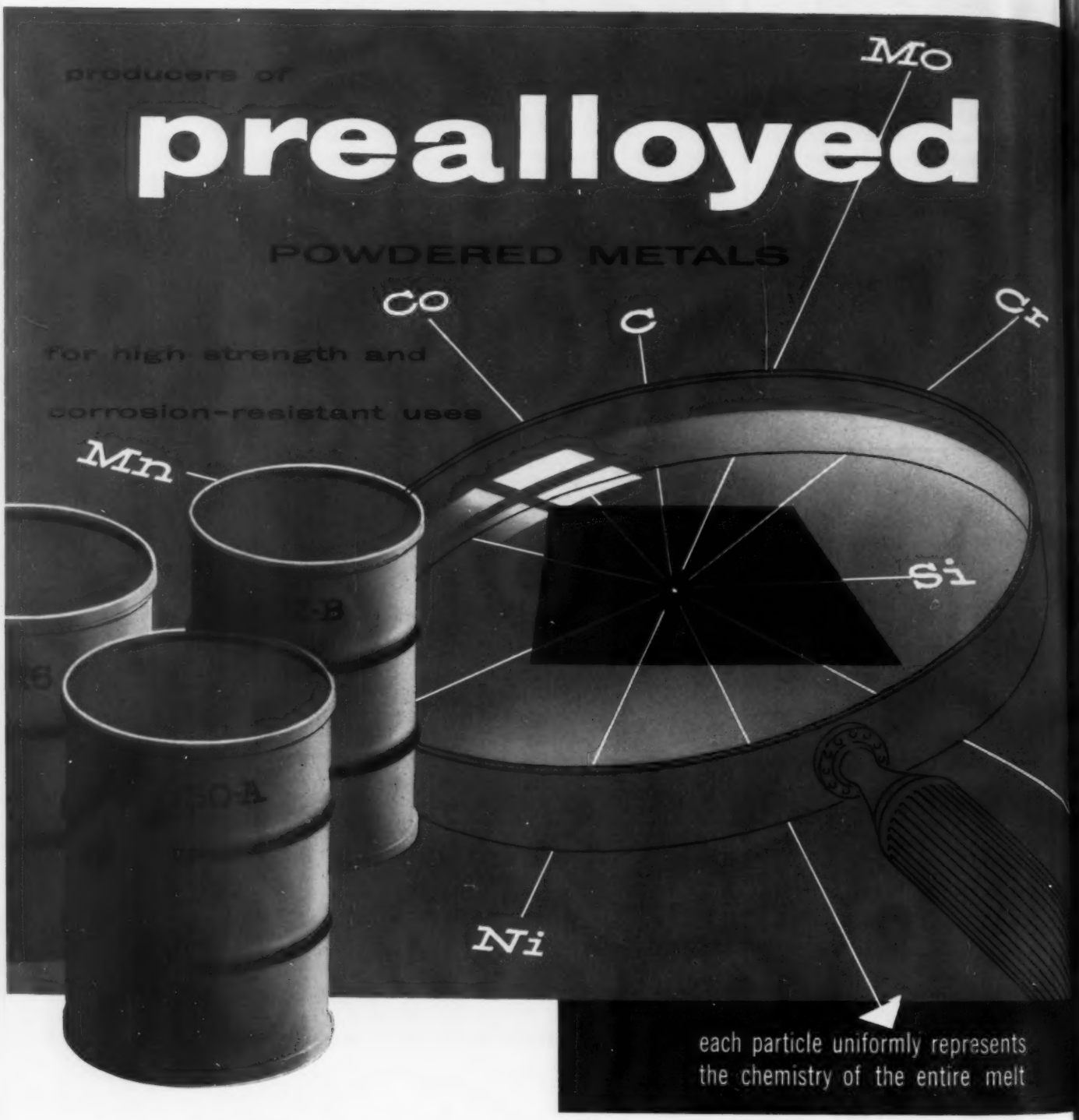

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COLONIAL STEEL DIVISION • ANCHOR DRAWN STEEL

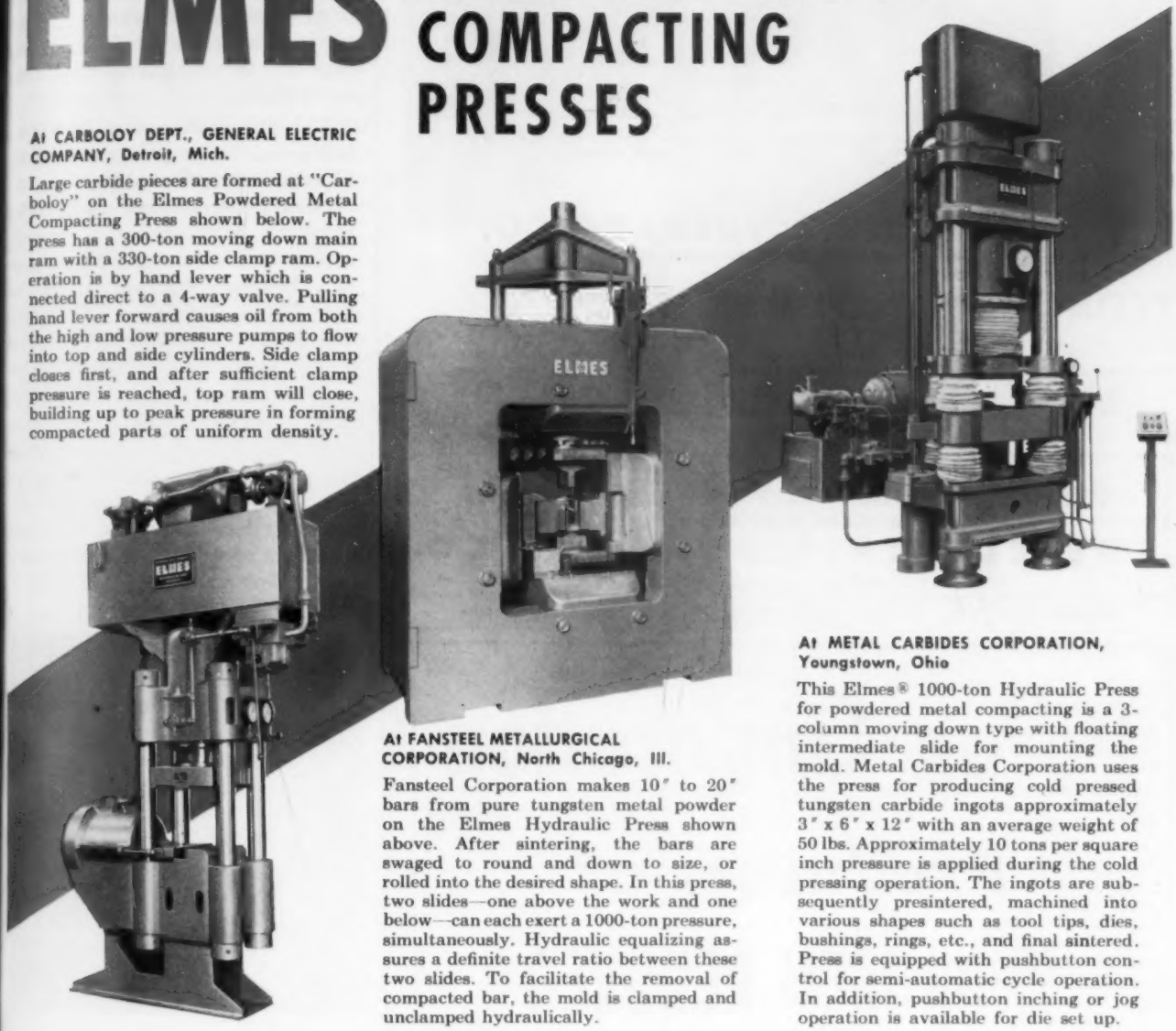
In Canada: **Vanadium-Alloys Steel Canada Limited, London, Ontario**

Leaders in the Industry choose

ELMES POWDERED METAL COMPACTING PRESSES

At CARBOLOY DEPT., GENERAL ELECTRIC COMPANY, Detroit, Mich.

Large carbide pieces are formed at "Carboloy" on the Elmes Powdered Metal Compacting Press shown below. The press has a 300-ton moving down main ram with a 330-ton side clamp ram. Operation is by hand lever which is connected direct to a 4-way valve. Pulling hand lever forward causes oil from both the high and low pressure pumps to flow into top and side cylinders. Side clamp closes first, and after sufficient clamp pressure is reached, top ram will close, building up to peak pressure in forming compacted parts of uniform density.



At FANSTEEL METALLURGICAL CORPORATION, North Chicago, Ill.

Fansteel Corporation makes 10″ to 20″ bars from pure tungsten metal powder on the Elmes Hydraulic Press shown above. After sintering, the bars are swaged to round and down to size, or rolled into the desired shape. In this press, two slides—one above the work and one below—can each exert a 1000-ton pressure, simultaneously. Hydraulic equalizing assures a definite travel ratio between these two slides. To facilitate the removal of compacted bar, the mold is clamped and unclamped hydraulically.

At METAL CARBIDES CORPORATION, Youngstown, Ohio

This Elmes® 1000-ton Hydraulic Press for powdered metal compacting is a 3-column moving down type with floating intermediate slide for mounting the mold. Metal Carbides Corporation uses the press for producing cold pressed tungsten carbide ingots approximately 3″ x 6″ x 12″ with an average weight of 50 lbs. Approximately 10 tons per square inch pressure is applied during the cold pressing operation. The ingots are subsequently presintered, machined into various shapes such as tool tips, dies, bushings, rings, etc., and final sintered. Press is equipped with pushbutton control for semi-automatic cycle operation. In addition, pushbutton inching or jog operation is available for die set up.

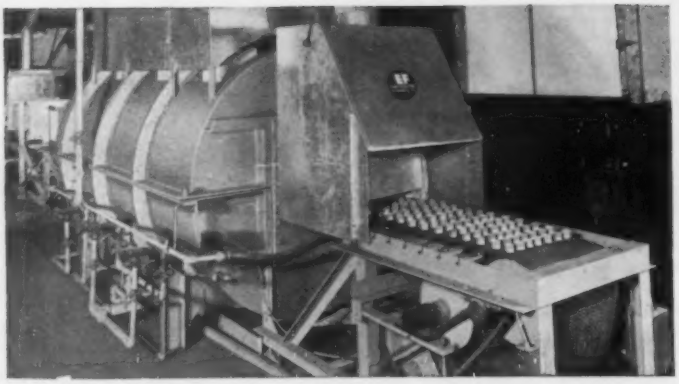
Three different and distinct types of Elmes® Hydraulic Presses for powdered metal compacting are featured above. Elmes engineers cooperated with each of these firms to design and build *exactly* the type of press that would best meet the user's individual requirements in this important field . . . presses that produce better, faster work and longer die runs, at lowest production and maintenance cost.

Elmes has had very extensive experience in the design and production of powdered metal compacting equipment. Our engineers have the "know how"—the all-essential *specific* background necessary for helping you solve your compacting problems to the *best* advantage. And they're always ready to do so, without obligation. For profit's sake—see your Elmes Distributor, or write us direct.

AMERICAN STEEL FOUNDRIES

ELMES ENGINEERING DIVISION

hydraulic presses and equipment .... 1166 TENNESSEE AVE., CINCINNATI 29, OHIO



An EF Gas Fired Cylindrical Muffle Continuous Furnace—one of numerous sizes and types we have built for sintering iron and non-ferrous powder products.

√ *Check with*
THE ELECTRIC FURNACE CO.
FOR FERROUS AND NON-FERROUS SINTERING FURNACES THAT PROVIDE FOR . . .

(a) maximum pounds of quality product per dollar of investment.
(b) lowest cost per pound for the sintering operation.
(c) maximum uniformity of size for sintered products.

Extensive experience in all heat processing phases in connection with powder metallurgy has enabled EF engineers to develop equipment for producing some really outstanding results.

We would like to discuss some of our latest furnace developments with you, if interested.

Gas-Fired, Oil-Fired EF *and Electric Furnaces*
for any Process, Product or Production
THE ELECTRIC FURNACE CO.
WILSON ST. at PENNA. R. R. *Salem - Ohio*

Canadian Associates • CANEFCO LIMITED • Toronto 1, Canada

Pyron Corporation

Producers of

HYDROGEN REDUCED IRON POWDER

And Distributors of

ELECTROLYTIC IRON POWDERS

Niagara Falls, N. Y.

For information write PYRON CORP., Box E LaSalle Station, Niagara Falls, N. Y.

Door Latch

Design of this locking member of a jam-proof door latch requires good strength, fair ductility, and enough hardness to withstand the wear encountered in many years of service. It must also present a smooth, clean appearance since it is a visible member in a high quality door assembly.

This part is first compacted from iron powders, sintered, and then infiltrated with copper to give it the necessary strength and density. The resulting composition is approximately 80 pct iron and 20 pct copper. The holes are then drilled, the part is barrel finished and plated. The high copper content provides an excellent base for plating.

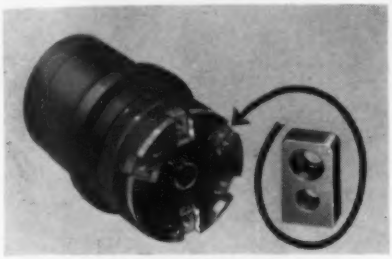
Powder metallurgy was the production method specified for this part from the start. A conservative comparison of the cost of the powdered metal part with the least expensive alternate method indicates a savings of 71 pct. *Data courtesy: Ceromet, Inc.*

Meter Parts

Irregularly shaped water meter parts are being produced by one manufacturer at a lower cost than was possible by machining the parts from bar stock. Type 316 prealloyed stainless steel powder is used. Both the method of manufacture and the parts, now used in several meter models, have been improved through use of powder. Since no machining is required, the process has eliminated scrap metal losses. *Data courtesy: Vanadium Alloys Steel Co.*

Terminal Clamp

Fabrication of terminal clamps used on an electrical control unit formerly required cutting rectangular brass bar to 6 in. length, milling a 0.281 in. dimension and 5/32 in. thickness, deburring, drilling, tapping and nickel plating to prevent discoloration. Now made of nickel-silver powder fabrication involves compacting, sintering and tapping a 6-40 hole. Estimated cost savings on this part are 84 pct. Dixon Sintaloy Inc. *Data courtesy: The New Jersey Zinc Co.*



Brass Flange

Brass flange used in electronic equipment is coined to a 95 pct density. The rectangular hole is maintained with a tolerance of ± 0.001 in. and the outside diameter is kept within this same tolerance. The final operation consists of annealing to prepare for subsequent silver plating. Concentricity of the rectangular hole with all outside surfaces is maintained to less than 0.003 in. total indicator reading. Former method of making the part consisted of forging, broaching and machining. *Data courtesy: American Sinterings Div., Engineered Plastics, Inc.*

WHY POWDER METALLURGY?

... Because Powder Metallurgy is the speedy, lower cost method of producing small metal parts with blueprint accuracy.

Parts may be so pressed and sintered that costly machining is eliminated or simplified.

Parts can be produced to close tolerances. For economy, there's no wasted metal—since die overflow powder can be reused.

WHY MD METAL POWDERS?

. . . Because nearly forty years of research and manufacturing experience have made MD the Headquarters for highest quality Metal Powders for every Powder Metallurgy need.

MD, the pioneer Metal Powder producer, is the *only* company producing *a complete line* of powders of such a wide range of metals and their alloys.

Remember
One Call
Does It All!

MD PRODUCTS
METAL POWDERS
METAL PIGMENTS
METAL ABRASIVES
Since 1916

METALS DISINTEGRATING COMPANY, INC.
Elizabeth B, New Jersey

Plants:
Elizabeth, N. J.; Manchester, N. H.;
Berkeley, Calif.; Emeryville, Calif.

SUBSIDIARY OF AMERICAN-MARIETTA COMPANY

WORLD'S LARGEST MANUFACTURER OF FINELY DIVIDED METALS

JOHNSON
Bronze-on-Steel
BOTH
surfaces

Where "two-side" bearing surfaces are required, Johnson Bronze-on-Steel is the answer. Floating connecting rod bearings often require this type of metal, also thrust washers. They are produced by bonding pre-cast bronze powder* to both sides of steel strip. This combines the fine bearing properties of copper-lead alloy with the strength and other properties of steel. This material is available in bearing form, or in strip form—rolls up to 400 feet or individual strips of any length for your own stamping or forming.

JOHNSON BRONZE COMPANY
505 South Mill Street, New Castle, Pa.

Write for information

JOHNSON B BEARINGS
Sleeve-Type

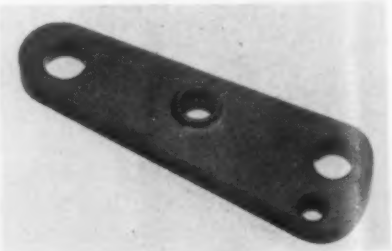
* To assure complete laboratory control of quality from the ingot to the finished product, Johnson Bronze has built a new powder plant for the production of alloy type powders by a patented process of disintegrating and quenching molten alloys. Therefore, the correct alloy for a particular use can always be prepared to correct specifications. This is another reason why Johnson Bronze has become known as Sleeve Bearing Headquarters.

Gear and Trip

A powdered iron gear and trip mechanism use in a phonograph turntable was molded in sponge iron at a fraction of the previous cost for making the part. The outside diameter is held to ±0.002 in. Length is held to ±0.005 in. Inside diameter is held to ±0.0005 in. Pitch diameter is 0.5625 in. Outside diameter is 0.635 in. *Data courtesy: Chicago Powdered Metal Products Co.*

Bracket

This powdered iron antenna rotator bracket replaces a two-piece assembly consisting of a stamping and a stainless steel bushing which was turned out on a screw machine and press fit into the center hole. As well as eliminating the required assembly operation of the two parts, powder metallurgy also offered close dimensional tolerances with accurate hole alignment, a good rust resistant finish, and lower cost. Alliance Mfg. Co. *Data courtesy: Keystone Carbon Co.*



The Iron Age INTRODUCES

Dr. Howard S. Turner, named vice-president — Research & Development, **Jones & Laughlin Steel Corp.**; and **Dr. Harold T. Clark,** becomes director of research.

B. T. Roe, elected vice-president, **Detroit Brass & Malleable Co.**

Lawrence R. Tierney, appointed vice-president, **Pennsylvania Foundry Supply and Sand Co.,** Philadelphia.

Virgil C. Rice, elected vice-president of manufacturing, Norge Div., **Borg-Warner Corp.**

Frederick R. Gruner, appointed vice-president — Operations, **Warren Foundry & Pipe Corp.,** New York.

John W. Kelly, appointed vice-president in charge of engineering, Adel Div., Burbank, Calif., **General Metals Corp.**

Dr. R. C. Gibson, promoted to assistant vice-president, **Parker Rust Proof Co.**

Guy J. Berghoff, appointed assistant to the vice-president in charge of Merchandising Div., **Pittsburgh Plate Glass Co.**

Charles H. Schwerin, appointed manager, Industrial Furnace Div., **The Gas Machinery Co.,** Cleveland.

Lucas P. Hart, Jr., appointed manager of manufacturing, **General Electric Co.,** Capacitor Dept.

John M. Horvath, appointed a direct factory representative, **Hy-Pro Tool Co.,** New Bedford, Mass.

Harry R. Bohme, appointed superintendent of stores, **Kaiser Steel Corp.,** Fontana, Calif., plant.

Robert B. Heppenstall, Jr., named general manager, Bridgeport, Conn., plant, **Heppenstall Co.**

R. W. Sykes, named sales manager, Metal Buildings Div., **Inland Steel Products Co.,** Milwaukee; and **Lon S. Shealy,** appointed assistant sales manager.

Joseph R. Schaeffer, appointed chief engineer, **Blaw-Knox Co.,** Construction Equipment Dept., Blawnox, Pa.

Arthur Sansom, joins sales engineering staff, Can Machinery Div., **E. W. Bliss Co.,** Canton, Ohio.

J. A. McFetridge, appointed divisional comptroller, Frigidaire Div., **General Motors Corp.,** Dayton.

James J. Dugan, appointed Detroit district manager, **Federal Pacific Electric Co.,** Newark, N. J.

Michael D. Barnett, becomes sales representative for the midwestern district, Carboloy Dept., **General Electric Co.,** Detroit.

Robert W. Ertle, named superintendent of production, Canton Bearing factory, **The Timken Roller Bearing Co.; Kenneth R. Adair,** promoted to superintendent, Maintenance, Canton and Gambrinus bearing factories.

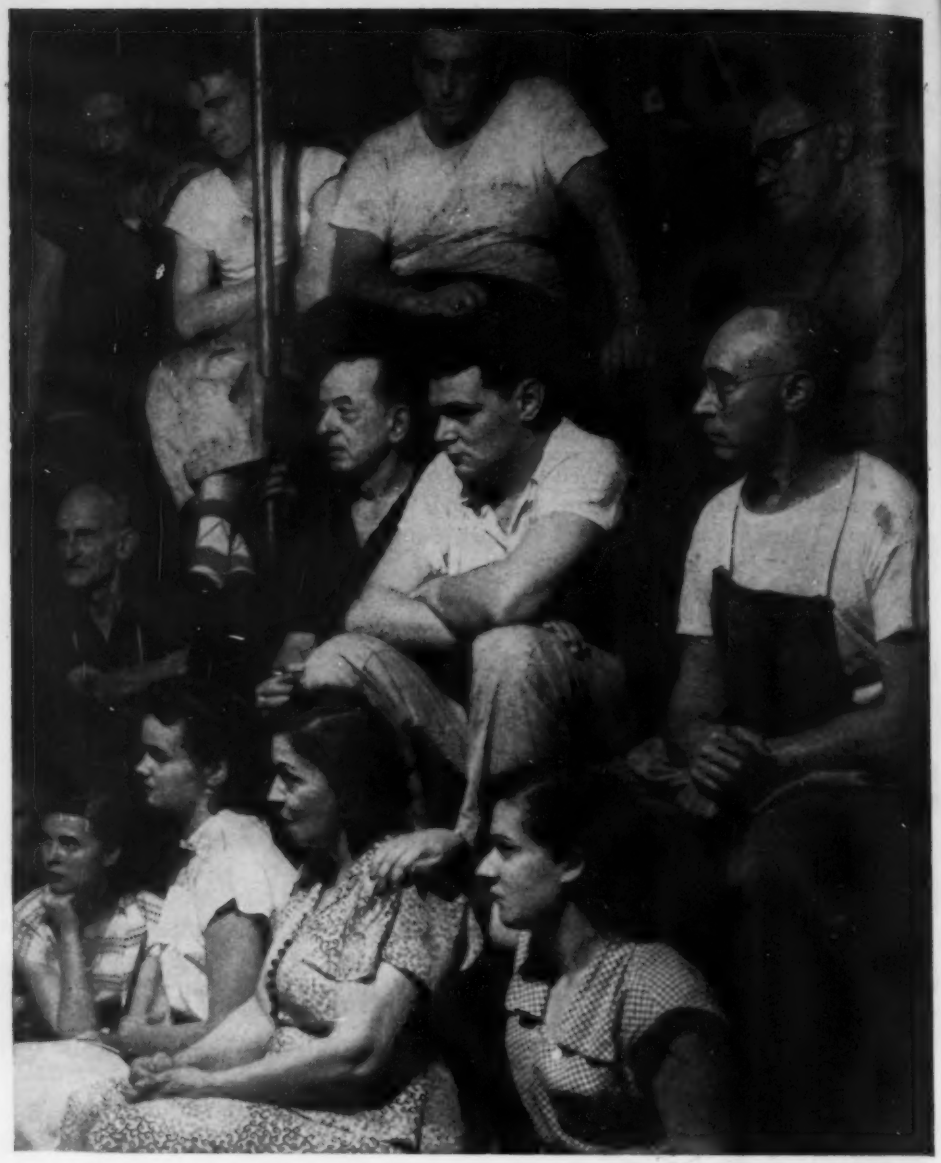
J. J. O'Neill, Jr., appointed assistant to the general manager, Explosives Div., **Olin Mathieson Chemical Corp.,** East Alton, Ill.; and **T. G. Blake,** named research and development manager, Explosives Div.

CARL J. MEISTER, appointed vice-president-Sales, Atkins Saw Div., Borg-Warner Corp.

CHARLES E. PETERSON, named chief metallurgist, Mackintosh-Hemphill Co.

JOHN E. FRIES, JR., appointed chief metallurgist, National Bearing Div., American Brake Shoe Co., New York.

JAMES W. FREDERICK, appointed abrasive engineer, Bay State Abrasive Products Co., Westboro, Mass.



the facts of life

about cancer

The facts of death from cancer are all too familiar. Too many have known the tragedy of losing a family member... a friend... a fellow worker. Too few know the facts of life about cancer. Yet they are there for the asking... or the seeing... or the listening. The American Cancer Society teaches life-saving facts about cancer every day of the year. Through films... pamphlets... exhibits... window displays... via radio... television... newspapers... magazines... from lecturers... information centers... you can learn vital facts that might one day mean the difference between life and death.

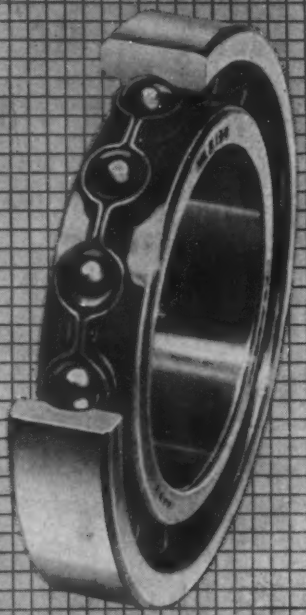
The American Cancer Society maintains the first line of defense in the battle against man's cruelest enemy. Teaching you how to protect yourself and your loved ones from death by cancer, supporting research in more than 100 medical and scientific centers, keeping your doctor informed of new techniques of diagnosis and treatment are but a few of the Society's many functions, all of them directed to the ultimate conquest of the disease.

Don't turn away from the facts about cancer. They can be the facts of life for you and your family. Visit the American Cancer Society office nearest you, or write to "Cancer" in care of your local Post Office.

American Cancer Society

down on the farm-

Rocks and bumps—exposure to all kinds of weather—they're part of the everyday job of International tractors and earth-moving equipment—and part of the everyday jobs of Federal Ball Bearings to keep them rolling.

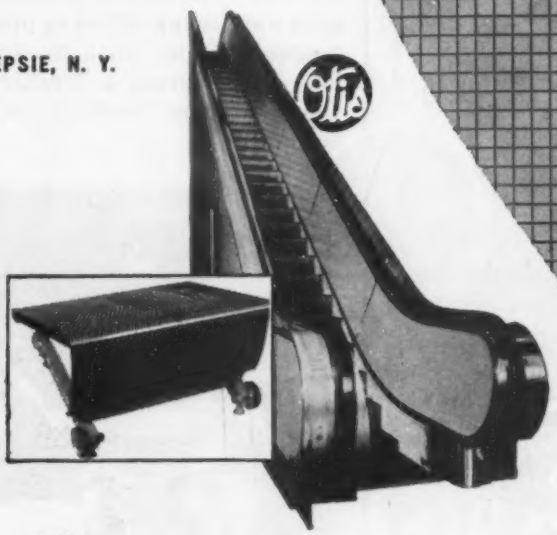


so much of industry *turns* on FEDERAL ball bearings

Tractors and escalators—cars and planes—if people and things are moving—Federal Ball Bearings keep them moving. In your home, office or factory, you'd probably find some of the hundreds of bearing types that this 50-year-old company is now making in over 12,000 sizes.

When Federal Ball Bearings are a part of so many things you *use*, shouldn't they be a part of the things you *make?*

THE FEDERAL BEARINGS CO., INC. • POUGHKEEPSIE, N. Y.



or up an escalator-

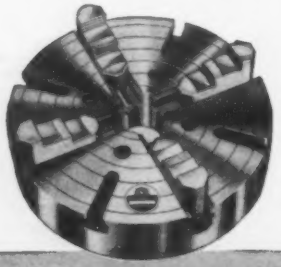
Getting thousands of workers in and out of subways, bus terminals and skyscrapers puts repeated, concentrated loads on Otis escalators and elevators. Federal Ball Bearings help take the ups and downs in quiet stride.

Federal BALL BEARINGS

One of America's Largest Ball Bearing Manufacturers

Have a look at the 256 pages of ball bearing information in Federal's catalog. Just drop us a line and we'll send you your copy.

this name is your guarantee of dependable performance . . . backed by 102 years experience in the manufacture of the world's finest chucks.



See your Distributor for a complete line of chucks by Horton — pioneer in J-Type chucks for jet engine machining.

HORTON CHUCK Since 1851

DIVISION OF
THE E. HORTON & SON CO.
WINDSOR LOCKS, CONN.

MILLING: Longer Tool Life

Helical carbide milling cutters reduce machining time in tests . . . Chips do not cling . . . Little vibration encountered . . . Cutting time per part reduced

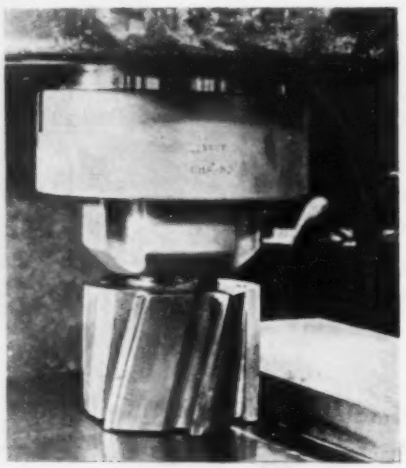
A new type milling cutter having brazed carbide inserts has tripled cutting speeds and increased tool life. Production engineers of the National Supply Co., Torrance, Calif., who studied this type cutter found chips do not cling to the cutter and very little vibration is encountered in the milling operation.

The helical carbide milling cutters combine the hardness of carbide with the efficiency of a true helix flute design. The cutter differs radically from the design of conventional milling cutters.

Uses 15° Helix Angle

Cutters used (Helicarb) in tests and production work are helical end mills 3 in. in diam, with six blades 3 in. long. The helix angle is 15° and the shanks are 2 in. in diam.

Drive shafts for steel mills provided the first production test for the Helicarb cutters. These 4140 steel forgings are heat treated to 270 Bhn. The turned 10-in. diam. ends were rough milled to produce tongues 3½ in. thick by 4⅜ in. long on a Kearney & Trecker Milwaukee 15-hp vertical milling machine.



Helical carbide cutter . . .

Average rate of stock removal was 2.1 lb per min. for a total of 105 lb removed. The maximum rate was 3.7 lb per min. or 13.1 cu in. per min. Cutting time per part was reduced from 145 minutes by the best previous method to 49 minutes. This reduced the total job time to 60 pct of former requirements. Spindle speed was 400 rpm.

WANT MORE DATA?

You may secure additional information on any item briefed in this section by using the reply card on page 105. Just indicate the page on which it appears. Be sure to note exactly the information wanted.

Foundry:

New handling system permits better space use.

An overhead handling system eliminates traffic jams in handling hot cupola iron at the LaCross, Wis., Works of Allis Chalmers Mfg. Co. The system made up of individual cranes and overhead rails also improved working conditions and increased production.

The cranes and monorail are Whiting Trambeam systems, manufactured by Whiting Corp., Harvey, Ill. In addition to mechanization of hot metal handling, the system has contributed to more efficient use of floor space since molds can be stacked higher than was formerly possible; dust reduction because of reduced floor traffic; improved employee morale and productivity; faster, more efficient charging.

The job starts with the cupola. Transfer ladles of 1000 lb capacity move to the tapping area on an overhead sidetrack which eliminates traffic jams between filled and empty ladles. The filled transfer ladle then moves on the main overhead rail to the production floor.

No Reservoir Ladle

Because of the faster handling there is no need for a reservoir ladle. Metal is poured directly into the transfer ladles. Total metal now poured ranges from 35,000 to 40,000 lb in 2 hours and 20 minutes, as compared with a maximum of 25,000 lb in the same time before installation of this method.

The time cycle for a 2000 lb charge has been reduced to 4½ minutes.

TESTING:

Dye reveals particles in abraded metal surfaces.

Imbedded particle of silica or alumina in sandblasted or abrasive polished metal surfaces can now be detected microscopically by a dye technique developed at the Rock Island Arsenal Laboratory. Microscopic examination of undyed rough surfaces reflects light from a myriad of point to hamper detection of the abrasive particles.

Clean ferrous metal surfaces are dyed an orange color when immersed in Chrysordine R dye solution. The dye is adsorbed or reacts with the free metal surface and is not adsorbed by the imbedded silica or alumina particles. Sandblasted panels examined by this technique have in some cases been estimated to have in excess of 5% of the total apparent surface covered with imbedded fragments of silica sand.

Percentage About the Same

The longer the blasting treatment the finer the imbedded particles become, but the overall percentage remains approximately the same. Application of the dyeing technique to abrasive paper polished surfaces revealed a small abrasive grain at the end of some of the microscopic scratches in the surface.

The dyeing method provides a means of determining the degree of

unusual

or simple

BIG or small

It's easier for Brandt —with modern and extensive facilities to meet your

QUANTITY NEEDS
with
PRECISION WORKMANSHIP

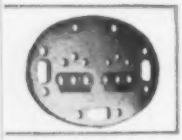
FORMINGS STAMPINGS WELDMENTS
in any type of metal

BRANDT
BALTIMORE

CHARLES T. BRANDT, INC.
1700 Ridgely Street, Baltimore 30, Maryland

how DE-STA-CO makes specialties S.O.P.*

Forty years' experience in the stamping business has taught us the value of giving our customers certain processing procedures which are ordinarily considered "extras". This policy of considering your needs first is largely responsible for our consistently rapid growth.



Close tolerance coining is one of the production methods that DeStaCo offers, not as a specialty, but as a Standard Operating Procedure. Our knuckle-action presses accommodate up to 400-ton capacity . . . frequently save you the additional expense of a grinding or machining operation.

Our precision parts department turns out critical stampings such as refrigerator intake and discharge valve reeds. These parts are made of heat-treated and ground imported DeStaCo valve steels. Our own Iso-Finish method provides a sealed-edge, strain-relieved surface for long life.

High-volume production of small, intricately-formed parts is done by Multi-Stamping. This is an entirely automatic method of processing complete parts in a single 4-slide machine. Progressive dies used in this operation are made in our own tool and die department.

Our production facilities include a number of high-speed, automatic presses to process your parts at the lowest possible unit cost.
Our plant is best-suited to quantity production runs of light to medium-heavy fabrication up to ⅜" material thickness. Our bed areas range from 10" x 12" to 48" x 72", pressures from 5 to 250 tons. We draw up to 4" deep.

Other DeStaCo specialties are Toggle Clamps for jigs and fixtures, Precision Washers, Arbor Spacers and Shims, Shim and Feeler Stock.

REPRESENTATIVES IN PRINCIPAL AREAS

Write us for our Stamping brochure

DE-STA-CO **DETROIT STAMPING COMPANY**

345 MIDLAND AVENUE • DETROIT 3, MICHIGAN

contamination of honed, lapped, or polished surfaces of cylinders, rods, etc. Contamination on sand-blasted or alundum abrasive blasted surfaces may be the cause of non-reproducability encountered when corrosion testing sand-blasted steel panels.

Clean sand-blasted panels were immersed in 0.5 pct distilled water solutions of several dye types without adjusting solution pH. Panels were allowed to remain in the dye for 30 minutes at room temperature. They were then rinsed in cold water and dried with clean compressed air. A microscopic examination was made to determine if the dye had produced a uniform and continuous film.

The dyes producing a substantially water insoluble and continuous film were then further studied to determine the pH where greatest adsorption and continuity occurred.

Only four dyes of the group investigated met these qualifications:

Dye	*pH*
Chrysordine R	3.52
Methylene Blue	5.15
Methyl Violet 2B	4.01
Nigrosine Black WS	9.55

Produced Deep Coloration

Methylene blue produced a deep blue coloration over the entire metal surface, leaving no evidence of silica being present. In this case the silica also adsorbed a portion of the dye. The methyl violet produced a continuous film, but in some cases failed to destroy the luster of the promentories on the rough surface. Light reflections caused the silica particles to be undistinguishable.

Nigrosine black WS produced a satisfactorily dyed surface but appeared also to be adsorbed on the surface of the silica. The resulting grey to black had insufficient contrast for easily detecting the more minute fragments of imbedded silica. At a temperature of 210°F, dye adsorption on the silica increased and was of no benefit for revealing imbedded silica particles.

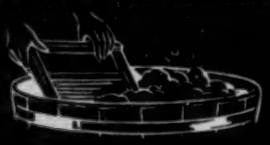
Chrysordine R dye in 0.5 pct solution at 70°F and at a pH of from 3.52 to 4.80 produces a uniform orange coloration of the metal surface only in 5 minutes.

How times have changed!

for instance:

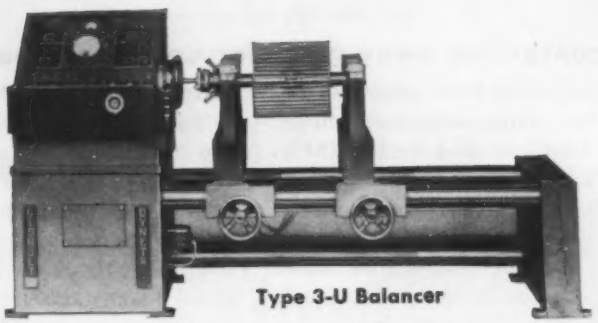
This was transportation . . . . **NOW** this is it.

This was the best cleaner . . . . until we got **THIS.**



The old rub-a-dub washdays . . . . gave way to **THIS.**

This was a balancer . . . . . . **until we built THIS!**



Type 3-U Balancer

Any job worth doing is worth doing *right!* And with today's precision manufacture and high-speed rotating parts, that applies to balancing more emphatically than ever.

If your work involves balancing, do it the *modern* way—with Gisholt DYNETRIC Balancing Machines. Here's unrivaled speed that enables you to locate and measure unbalance in a matter of seconds—unequalled accuracy, capable of detecting vibrations as small as .000025".

Gisholt Balancers are available for handling all kinds of rotating parts, from a fraction of an ounce to many tons. Write us for a copy of the booklet STATIC & DYNAMIC BALANCING.

DYNETRIC BALANCERS

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

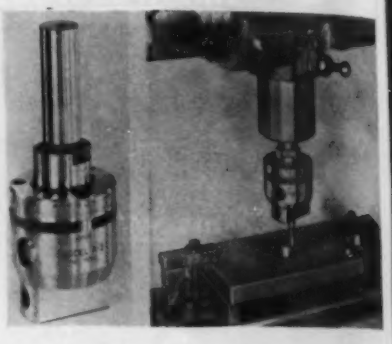
NEW EQUIPMENT

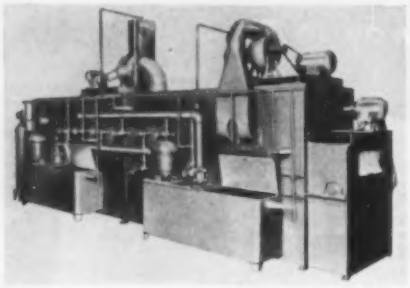
New and improved production ideas, equipment, services and methods described here offer production economies . . . for more data use the free postcard on page 105 or 106

Boring head permits adjustments by direct reading

Cost savings on both long production runs and single piece work (as in jig boring) are claimed for the new Deka-Bore boring head designed with two independent means of adjustment. The offset dovetailed tool holder slide is activated by the conventional micrometer screw for roughing-in the hole, and has a pre-determined pressure factor bearing on the gibs, completely eliminating back lash. Calibrations on the body of the Deka-Bore permit independent, direct, and positive adjustments of 0.0001 on the diameter or 0.00005 on a radius. The tool can be used on fixed or rotating applications. *Precision Tool & Mfg. Co. of Illinois.*

For more data circle No. 16 on postcard, p. 105.





Removes grinding residue from ball bearing parts

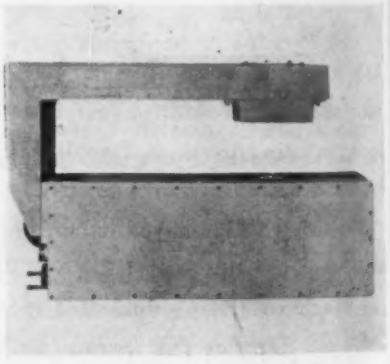
A special cleaning machine using low-flash petroleum type cleaning solvents has been designed to remove grinding residue and shop dirt from precision ball bearing parts before assembly. Parts, carried through the machine in baskets on a power driven roller conveyor, pass through a three-phase cleaning process; two washing operations and a blow-off to remove excess solvent. An automatic fire extinguishing and fire control system is standard equipment. *Alvey-Ferguson Co.*

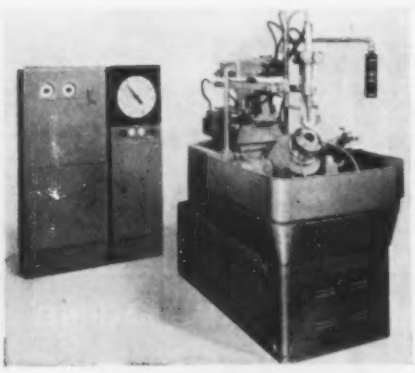
For more data circle No. 17 on postcard, p. 105.

Non-contacting x-ray gage for continuous gaging

The x-ray thickness gage is designed for gaging aluminum foil as thin as 0.0003 in. and steel as thick as 0.075 in. with accuracies of 1 pct. The gage utilizes a split x-ray beam, directing part of the beam through a wedge shaped disk, having a variation in thickness equal to the range of the gage, while the remainder of the beam penetrates the material being gaged. As the strip progresses through the mill, a difference in thickness between the wedge and the gaged material will cause the electrical balance system to equalize them by revolving the wedge and thus show a meter reading equivalent to this thickness gage. The gage can be furnished with dual or even three ranges if required. *Pratt & Whitney.*

For more data circle No. 18 on postcard, p. 105.





Electronic mechanism controls gear surface hardening

A sensitive electronic control is featured on the new and improved models of Gleason gear surface hardeners. On these machines oxyacetylene flames traverse each individual tooth separately. A sensitive radiation pyrometer is focused directly on the tooth being heated, and receives radiant energy from the hot metal. An electronic balancing mechanism translates that energy into forces which control the travel of the burners along the tooth. Operation of the machines is entirely automatic, after the optimum hardening temperature is pre-set by the operator, and the machine is started. Heating to correct hardening temperature and uniform hardening of all teeth on a gear are assured. *Gleason Works.*

For more data circle No. 19 on postcard, p. 105.

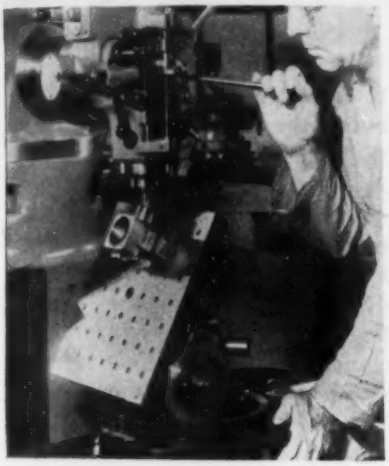
New accessories increase usefulness of Payloader

Two pieces of accessory equipment increase the usefulness of Model HM 4-wheel-drive Payloader tractor-shovel to many users. One is a wide pusher plate of heavy rolled steel for rear-mounting so that the machine can push stalled trucks and other equipment and spot railroad cars. This pusher plate also includes a retractable towing link, making it possible for this big 1½ cu yd tractor-shovel to tow, haul or skid loads. To use the Model HM as a prime mover to haul hydraulic controlled scrapers, wagons, rooters, etc., a set of hydraulic connections and valves can be installed for control of the hauled equipment. *Frank G. Hough Co.*

For more data circle No. 20 on postcard, p. 105.

Angle computer

The Studler angle computer is a versatile measuring device that rotates 360° in three planes for surveying angles of precision machined parts, castings and die work. It is said to reduce inspection time as much as one-half to one-tenth over the sine bar method and has the advantage of its use being quickly taught to inexperienced workers. Three axes of rotation, horizontal, vertical and radial are incorporated. All protractors are graduated from 0 to 90° in four sections of the circle. Verniers are furnished in one minute graduations (0.0001 in.) as standard equipment. Five models are available. *Angle Computer Co.*



For more data circle No. 21 on postcard, p. 105.

Flexible plastic pipe

Lightweight flexible plastic pipe, Series 200, is made of 100 pct virgin polyethylene resin and guaranteed to be non-toxic. It is said not to rot, rust, or corrode; is easily handled; requires no special tools to install. Economy and long service are its advantages. *Quaker Rubber Corp.*

For more data circle No. 22 on postcard, p. 105.

Turn Page

Cowles

DRYORTH*

Anhydrous Sodium Orthosilicate

High-powered Cleaning at Low Cost

• Cowles DRYORTH is free-flowing, granular, dust-free. It contains not less than 60% Na_2O and is quickly and completely soluble.

DRYORTH is a fast, economical cleaner for

★ strip and sheet steel
★ steel pipe — before galvanizing
★ heavy ferrous parts and castings

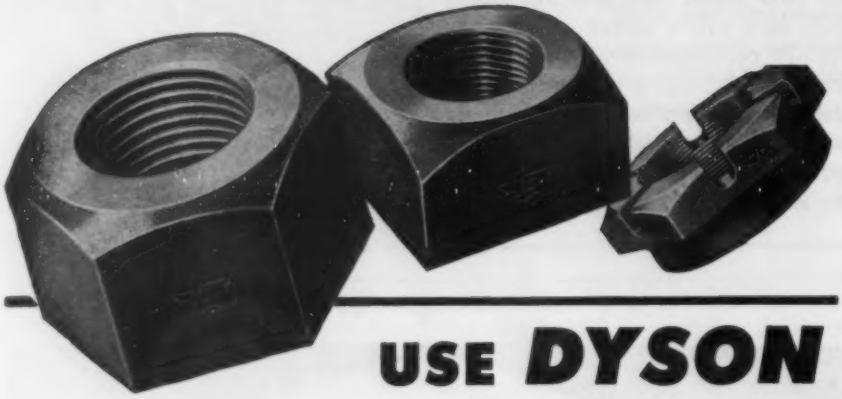
Try DRYORTH for these and other basic cleaning operations. DRYORTH — anhydrous sodium orthosilicate — assures long cleaning mileage at low cost.

*Reg. U. S. Pat. Off.

Cowles also manufactures a complete line of cleaners engineered to handle all kinds of cleaning problems on both ferrous and non-ferrous metals. The Cowles Technical Man in your area will be glad to discuss any metal cleaning problems you have. Write us today!

COWLES CHEMICAL COMPANY
7016 Euclid Avenue
Cleveland 3, Ohio

FOR YOUR LARGE FASTENERS



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- 36 years experience in manufacturing fine welding equipment.
- Modern designing by top-flight welding engineers.
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- Thousands of users throughout the world have, for years, used Weldit torches for every welding requirement.
- Originators of the famous Weldit Weldimatic torch and the Weldit Gasaver.

WELDIT BLOWPIPE

The new Weldit Weldimatic Blowpipe fabricated of special aluminum alloy, combines advantages that appeal to every welder.
The C-47-W features light weight, less operator fatigue, increased capacity, more economy. The pilot automatically relights blowpipe when lever is pressed. Built to close engineering standards, plungers are of stainless steel, special design provides constant tension on pilot adjustment. Write for descriptive folder.

Canadian Distributor:—Alloy Metal Sales, 181 Fleet St., E., Toronto 5, Ontario, Canada.

HISTORY OF WELDING

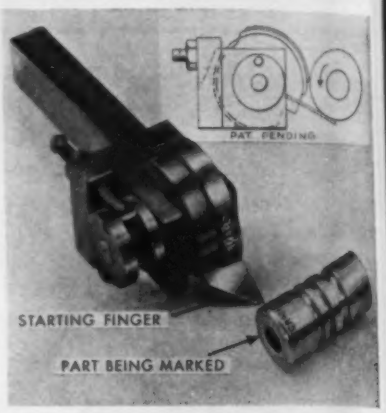
Roman artificers working at a primitive anvil, welding a sword handle to a blade by the Fusion Method of welding. The early Romans were gifted in this art several centuries before Christ.

Weldit INC. SINCE 1918

990 OAKMAN BLVD.
DETROIT 38, MICHIGAN

Roller die marking

In the marking of names, numbers, trade-marks, graduations, etc., on round metal surfaces, a new Hoffman starting finger for use with roller dies enables oscillation of the stamp mechanism automatically as the work is being advanced



to contact with the die. The finger starts the movement of the die as the lathe brings the work toward it. By meeting the die and work simultaneously, scoring, chatter marks or defacing of piece parts are said to be eliminated. Roller dies incorporating the starting finger are used on any turning machines. *Quality Die Co.*

For more data circle No. 23 on postcard, p. 105.

Illuminated pyrometer

A new illuminated dial feature which is incorporated as an extra in the Xactemp hand pyrometer line permits reading the pyrometer in poorly lighted areas without

flashlight or auxiliary lighting. Two easily replaced pen lite batteries are contained in the handle of the instrument. Pushbutton switch lights the bulb under the shield. *Claud S. Gordon Co.*

For more data circle No. 24 on postcard, p. 105.

The Iron Age SUMMARY . . .

Mills continue to raise production sights . . . Predict more output gains . . . New orders come from wide range of industries

Production . . . Steel mills continued to raise their production sights this week, with ingot production scheduled at 69.0 pct of rated capacity, up one-half point from last week's revised rate of 68.5. Ingot production index is estimated at 102.2 (1947-49 = 100).

And there are increasing signs that production will continue its slow but steady growth of the past few weeks. Rate of climb may accelerate next month, as steelmakers are talking now of operating in the 80 pct range during fourth quarter.

Scrap . . . Another important steel weathervane continued to indicate brisk trade winds this week. THE IRON AGE Heavy Melting Steel Scrap Composite Price remained unchanged at $30.17, high point for the year. And the scrap industry this week recorded further price advances not yet reflected in openhearth steelmaking grades.

Demand . . . As a barometer of overall economic weather, the steel picture is encouraging. Ingot operations are tied closely to new order volume (pressure is high for fast delivery), and current increase in steel buying is not limited to any one industry. Rather, it reflects a general quickening of overall metalworking activity.

The much talked-about flood of automotive orders still hasn't appeared. But this shouldn't be taken too much to heart. The automotive buying picture is brighter than it has been painted. Here are some of the highlights:

¶ Automotive steel buying is on the upgrade. While volume is not yet high, some automakers have stepped up purchasing of flat-rolled items, some bars. And parts suppliers are buying.

¶ Initial steel buying for a new model is traditionally on the light side. There are just too many problems that can crop up when a new model goes into production to justify heavy steel buying, particularly when steel is easy and deliveries fast. And the two biggest producers, Ford and Chevrolet, have the most complex changeover problems.

¶ Downtime is staggered among producing companies even within divisions. Hence, while a sudden upsurge in steel buying doesn't seem to be in the cards, there's been no bad period.

Distribution . . . Warehouses are battling to regain customers lost to mills in recent months. Latest move is a general shifting of quantity limits. Aggressive selling seems to be paying off; in Cleveland, for example, some warehouses are out of stock on some standard sizes of sheets.

Steel Output, Operating Rates

	This Week†	Last Week	Month Ago	Year Ago
Production (Net tons, 000 omitted)	1,642	1,637	1,525	2,149
Ingot Index (1947—49=100)	102.2	101.9	94.9	133.8
Operating Rates				
Chicago	70.0	68.5	69.0	99.5
Pittsburgh	67.0	67.0*	64.0	100.0
Philadelphia	58.0	58.0	56.0	96.0
Valley	57.0	57.0	64.0	95.0
West	83.0	84.0*	77.0	97.0
Detroit	89.0	84.0	74.0	93.0
Buffalo	56.5	56.5	56.5	106.5
Cleveland	73.5	75.0	51.0	93.5
Birmingham	71.0	75.0	69.0	96.5
S. Ohio River	79.0	79.0	74.0	82.5
Wheeling	93.0	93.0	77.0	98.0
St. Louis	68.5	69.0	56.0	96.0
East	51.0	46.0*	47.0	86.0
Aggregate	69.0	68.5*	65.0	95.0

* Revised. † Tentative

Prices At A Glance

(cents per lb unless otherwise noted)

	This Week	Week Ago	Month Ago	Year Ago
Composite prices				
Finished Steel, base	4.801	4.801	4.801	4.634
Pig Iron (gross ton)	$56.59	$56.59	$56.59	$56.59
Scrap, No. 1 hvy (gross ton)	$30.17	$30.17	$28.67	$31.50
Nonferrous				
Aluminum, ingot	22.20	22.20	22.20	21.50
Copper, electrolytic	30.00	30.00	30.00	29.50
Lead, St. Louis	14.55	14.55	14.05	13.30
Magnesium, ingot	27.75	27.75	27.75	27.00
Nickel, electrolytic	63.08	63.08	63.08	63.08
Tin, Straits, N. Y.	93.50	93.625	92.50	82.75
Zinc, E. St. Louis	11.50	11.50	11.00	10.00

Order Books Spark Optimism

Gradual, steady pickup under way . . . Galvanized paces a strengthening sheet market . . . Automakers shelve stainless trim . . . Some warehouses post new, greater discounts for quantity.

◆ EVEN the usually cautious steel executives are beginning to believe that their market has taken a definite turn for the better. The order books on nearly all products are supporting this optimistic feeling.

It's an old refrain with a slightly heavier hand on the fortissimo —the pickup is gradual but steady. And, in addition, the expected bulge from automotive buyers is still to come.

For the first time since it began production last April, the new cold-rolled sheet mill of Pittsburgh Steel Co. is operating on a three-shift basis, compared with two shifts previously. Improved order situation is responsible.

Earlier, Pittsburgh Steel announced it plans to bring into production its No. 2 blast furnace, down since last August, also due to better business conditions. The furnace will be blown in Oct. 1, putting two out of firm's three furnaces in production.

Linepipe producers are encouraged by announcement that Trans-Canada Pipe Lines, Ltd., will begin delivering gas to the Midwest by next fall. This means that construction of a 30-in. and 36-in. pipeline must begin by next spring. It is estimated line will require approximately 1 million tons of pipe, and three-fourths of this is expected to come from U. S. producers.

Warehouses are fighting to regain business lost to the mills, which have been accepting warehouse-size orders to keep the wheels turning. In Cleveland and Cincinnati, new quantity brackets designed to make warehouses more attractive to consumers lured by the mills, have been put into effect. Other distributors are expected to follow suit.

SHEETS AND STRIPS . . . Plenty of optimism but few orders in **Detroit.** Here's the reason: Initial buying for new models is not heavy because production bugs in first few weeks hold car output to minimum. But Detroit mills are stepping up producton rates weekly in expectation that buying for November delivery will show upsurge. In **Chicago** cold-rolled on 6-7 week delivery basis, but hot-rolled and strip still dull; one mill reports slightly longer lead time on hot-rolled, but situation is not general. In the **East,** solid gains were made in September; hot-dip galvanized on 7-week delivery and continuous hot-dip up to 14 weeks. **Pittsburgh** mills note upturn in both hot- and cold-rolled sheets. Galvanized still going strong in **Cleveland** and **Chicago.** Tinplate is fair to good.

STAINLESS . . . Word from **Detroit** is not encouraging. While stainless market has held up fairly well there, the amount of stainless trim on new models is disappointing. With nickel available, trend now appears to be toward plated carbon steel rather than stainless. On the credit side, a **Cleveland** mill reports export business on stainless has picked up, principally in English market; volume of inquiries indicate future export orders will be good.

Purchasing Agent's Checklist

PLATES AND STRUCTURALS . . . Plates on short delivery, but volume is holding up. **Chicago** is on 2-3 week delivery basis and consumers are playing inventories close to vest. Market is strong on the West Coast, where several good-sized jobs are pending in water and petroleum industries. In **East,** demand is fading slowly but fall upturn is expected. Volume holding fairly well in **Pittsburgh** but deliveries on short-term basis. Structurals market continues firm but short delivery being offered on all but wide flange beams. Highway and construction business sustaining market in the **East,** but fabricated prices are competitive.

BARS . . . **Chicago:** Hot-rolled market stronger due to farm equipment buying, but cold-finished demand desultory; automotive buyers still keeping hands off; slight rise in warehouse buying. **Detroit** hot-rolled improving gradually but cold-finished dull; situation generally looking better. **East:** Still looking for automotive buying to inject life into market; re-bars holding steady with prices competitive. **Coast:** Construction jobs giving lift to market. **Pittsburgh:** Slight pickup in both hot-rolled and cold-finished.

PIPE AND TUBING . . . Backlog is off on oil country in **Chicago** and other producing centers, but volume is holding up well. Electric weld and seamless very good in **Chicago.** Continued demand from construction outlets is maintaining standard pipe at fair to good level.

WAREHOUSE . . . New quantity brackets are being posted in **Cleveland** and **Cincinnati** to win back customers that shifted to the mills.

New Schedule, 2000-5000 lb—base
5000-10,000—10¢ off
10,000-20,000—30¢ off
20,000-30,000—50¢ off
30,000 and over 70¢ off

Old Schedule, 1000-500 lb—base
5000-10,000—10¢ off
10,000-20,000—20¢ off
20,000-39,999—40¢ off
40,000 and over 50¢ off

Cleveland distributors report good business on re-bars for Ohio Turnpike job; one fabricating shop working 10 hrs a day, 6 days a week; galvanized short and regular sheets getting tighter; some standard gages and sizes out of stock, 16-gage in particular. Every auto plant maintenance has stimulated structural and plate business in **Detroit,** but otherwise market there is sluggish. Better tone reported generally.

Comparison of Prices

(Effective Sept. 28, 1954)

Steel prices on this page are the average of various f.o.b. quotations of major producing areas: Pittsburgh, Chicago, Gary, Cleveland, Youngstown.

Price advances over previous week are printed in Heavy Type; declines appear in *Italics*.

	Sept. 28 1954	Sept. 21 1954	Aug. 31 1954	Sept. 29 1953
Flat-Rolled Steel: (per pound)				
Hot-rolled sheets	4.05¢	4.05¢	4.05¢	3.925¢
Cold-rolled sheets	4.95	4.95	4.95	4.775
Galvanized sheets (10 ga.)	5.45	5.45	5.45	5.275
Hot-rolled strip	4.05	4.05	4.05	3.925
Cold-rolled strip	5.82	5.82	5.82	5.575
Plate	4.237	4.237	4.237	4.10
Plates wrought iron	9.30	9.30	9.30	9.30
Stain'l's C-R strip (No. 302)	41.50	41.50	41.50	41.50
Tin and Terneplate: (per base box)				
Tinplate (1.50 lb.) cokes	$8.95	$8.95	$8.95	$8.95
Tinplate, electro (0.50 lb.)	7.65	7.65	7.65	7.65
Special coated mfg. ternes	7.75	7.75	7.75	7.75
Bars and Shapes: (per pound)				
Merchant bars	4.312¢	4.312¢	4.312¢	4.15¢
Cold-finished bars	5.40	5.40	5.40	5.20
Alloy bars	5.075	5.075	5.075	4.875
Structural shapes	4.25	4.25	4.25	4.10
Stainless bars (No. 302)	35.50	35.50	35.50	35.50
Wrought iron bars	10.40	10.40	10.40	10.40
Wire: (per pound)				
Bright wire	5.75¢	5.75¢	5.75¢	5.525¢
Rails: (per 100 lb.)				
Heavy rails	$4.45	$4.45	$4.45	$4.325
Light rails	5.35	5.35	5.35	5.20
Semifinished Steel: (per net ton)				
Rerolling billets	$64.00	$64.00	$64.00	$62.00
Slabs, rerolling	64.00	64.00	64.00	62.00
Forging billets	78.00	78.00	78.00	75.50
Alloy blooms, billets, slabs	86.00	86.00	86.00	82.00
Wire Rod and Skelp: (per pound)				
Wire rods	4.675¢	4.675¢	4.675¢	4.525¢
Skelp	3.90	3.90	3.90	3.75
Finished Steel Composite: (per pound)				
Base price	4.801¢	4.801¢	4.801¢	4.634¢

	Sept. 28 1954	Sept. 21 1954	Aug. 31 1954	Sept. 29 1953
Pig Iron: (per gross ton)				
Foundry, del'd Phila.	$61.19	$61.19	$61.19	$61.19
Foundry, Valley	56.50	56.50	56.50	56.50
Foundry, Southern, Cin'ti	60.43	60.43	60.43	60.43
Foundry, Birmingham	52.88	52.88	52.88	52.88
Foundry, Chicago	56.50	56.50	56.50	56.50
Basic del'd Philadelphia	60.27	60.27	60.27	60.27
Basic, Valley furnace	56.00	56.00	56.00	56.00
Malleable, Chicago	56.50	56.50	56.50	56.50
Malleable, Valley	56.50	56.50	56.50	56.50
Ferromanganese‡, cents per lb.	9.50¢	9.50¢	10.00¢	10.00¢
‡ 74-76 pct Mn base.				
Pig Iron Composite: (per gross ton)				
Pig iron	$56.59	$56.59	$56.59	$56.59
Scrap: (per gross ton)				
No. 1 steel, Pittsburgh	$31.50	$31.50	$29.50	$34.50
No. 1 steel, Phila. area	28.50	28.50	27.00	30.50
No. 1 steel, Chicago	30.50	30.50	29.50	29.50
No. 1 bundles, Detroit	26.50	25.00	23.50	28.50
Low phos., Youngstown	32.50	32.50	31.50	37.50
No. 1 mach'y cast, Pittsburgh	42.50	42.50	42.50	43.50
No. 1 mach'y cast, Phildel'a.	41.00	41.00	40.50	41.00
No. 1 mach'y cast, Chicago	42.50	42.50	39.50	35.50
Steel Scrap Composite: (per gross ton)				
No. 1 heavy melting scrap	$30.17	$30.17	$28.67	$31.50
Coke, Connellsville: (per net ton at oven)				
Furnace coke, prompt	$14.38	$14.38	$14.38	$14.75
Foundry coke, prompt	16.75	16.75	16.75	16.75
Nonferrous Metals: (cents per pound to large buyers)				
Copper, electrolytic, Conn.	30.00	30.00	30.00	29.50‡
Copper, Lake, Conn.	30.00	30.00	30.00	30.125
Tin, Straits, New York	*93.50*†	93.625*	92.50	82.75
Zinc, East St. Louis	11.50	11.50	11.00	10.00
Lead, St. Louis	14.55	14.55	14.05	13.30
Aluminum, virgin ingot	22.20	22.20	22.20	21.50
Nickel, electrolytic	63.08	63.08	63.08	63.08
Magnesium, ingot	27.75	27.75	27.75	27.00
Antimony, Laredo, Tex.	28.50	28.50	28.50	34.50

† Tentative. ‡ Average. * Revised.

Finished Steel Composite

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold rolled sheets and strips.

Pig Iron Composite

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

Steel Scrap Composite

Average of No. 1 heavy melting steel scrap delivered to consumers at Pittsburgh, Philadelphia and Chicago.

PIG IRON

Dollars per gross ton, f.o.b., subject to switching charges.

←To identify producers, see Key on P. 137→

Producing Point	Basic	Fdry.	Mall.	Bess.	Low Phos.
Bethlehem *B3*	58.00	58.50	59.00	59.50	.....
Birmingham *R3*	52.38	52.88	.....	.....	.....
Birmingham *W9*	52.38	52.88	.....	.....	.....
Birmingham *U4*	52.38	52.88	56.50	.....	.....
Buffalo *R3*	56.00	56.50	57.00	.....	.....
Buffalo *I11*	56.00	56.50	57.00	.....	.....
Buffalo *W6*	56.00	56.50	57.00	.....	.....
Chicago *I4*	56.00	56.50	56.50	57.00	.....
Cleveland *A5*	56.00	56.50	56.50	57.00	61.00
Cleveland *R3*	56.00	56.50	56.50	.....	.....
Daingerfield *L3*	52.50	52.50	52.50	.....	.....
Duluth *I4*	56.00	56.50	56.50	57.00	.....
Erie *I4*	56.00	56.50	56.50	57.00	.....
Everett *M6*	.....	61.00	61.50	.....	.....
Fontana *K1*	62.00	62.50	.....	.....	.....
Geneva, Utah *C7*	56.00	56.50	.....	.....	.....
Granite City *G2*	57.90	58.40	58.90	.....	.....
Hubbard *Y1*	.....	.....	56.50	.....	.....
Minnequa *C6*	58.00	59.00	59.00	.....	.....
Monessen *P6*	56.00	.....	.....	.....	.....
Neville Isl. *P4*	56.00	56.50	56.50	.....	.....
Pittsburgh *U1*	56.00	.....	.....	57.00	.....
Sharpsville *S3*	56.00	56.50	56.50	57.00	.....
So. Chicago *R3*	56.00	.....	56.50	.....	.....
Steelton *B3*	58.00	58.50	59.00	59.50	64.00
Swedeland *A2*	58.00	58.50	59.00	59.50	.....
Toledo *I4*	56.00	56.50	56.50	57.00	.....
Troy, N. Y. *R3*	58.00	58.50	59.00	59.50	64.00
Youngstown *Y1*	.....	.....	56.50	57.00	.....
N. Tonawanda *T1*	.....	56.50	57.00	.....	.....

DIFFERENTIALS: Add 50¢ per ton for each 0.25 pct silicon over base (1.75 to 2.25 pct except low phos., 1.75 to 2.00 pct) 50¢ per ton for each 0.50 pct manganese over 1 pct, $2 per ton for 0.5 to 0.75 pct nickel, $1 for each additional, 0.25 pct nickel. Subtract 38¢ per ton for phosphorus content 0.70 and over.

Silvery Iron: Buffalo, *H1*, $68.25; Jackson, *J1*, *G1* $67.00. Add $1.50 per ton for each 0.50 pct silicon over base (6.01 to 6.50 pct) up to 17 pct. Add $1 per ton for 0.75 pct or more phosphorus. Add 75¢ for each 0.50 pct manganese over 1.0 pct. Bessemer ferrosilicon prices are $1 over comparable silvery iron.

STAINLESS STEEL

Base price cents per lb. f.o.b. mill

Product	301	302	303	304	316	321	347	410	416	430
Ingots, rerolling	16.25	17.25	18.75	18.25	28.00	22.75	24.50	14.00	.....	14.25
Slabs, billets, rerolling	20.50	22.75	24.75	23.75	36.25	29.50	32.25	18.25	.....	18.50
Forg. discs, die blocks, rings	38.50	38.50	41.50	40.50	60.00	45.50	50.75	31.00	31.75	31.75
Billets, forging	29.50	29.75	32.25	31.00	46.50	35.25	39.50	24.00	24.50	24.50
Bars, wires, structurals	35.25	35.50	38.25	37.25	55.50	42.00	46.75	28.75	29.25	29.25
Plates	37.25	37.50	39.75	39.75	58.75	45.75	51.25	30.00	30.50	30.50
Sheets	41.25	41.50	48.75	43.75	62.75	50.50	59.25	34.25	41.25	34.75
Strip, hot-rolled	29.75	32.00	36.75	34.25	53.25	41.00	46.50	26.25	.....	27.00
Strip, cold-rolled	38.25	41.50	45.50	43.75	62.75–63.00	50.50–50.75	59.25	34.25	41.25	34.75

STAINLESS STEEL PRODUCING POINTS:

Sheets: Midland, Pa., *C11*; Brackenridge, Pa., *A3*; Butler, Pa., *A7*; McKeesport, Pa., *U1*; Washington, Pa., *W2*, *J2*; Baltimore, *E1*; Middletown, O., *A7*; Massillon, O., *R3*; Gary, *U1*; Bridgeville, Pa., *U2*; New Castle, Ind., *I2*; Ft. Wayne, *J4*.

Strip: Midland, Pa., *C11*; Cleveland, *A5*; Carnegie, Pa., *S9*; McKeesport, Pa., *F1*; Reading, Pa., *C2*; Washington, Pa., *W2*; W. Leechburg, Pa., *A3*; Bridgeville, Pa., *U2*; Detroit, *M2*; Canton-Massillon, O., *R3*; Middletown, O., *A7*; Harrison, N. J., *D3*; Youngstown, *C5*; Sharon, Pa., *S1*; Butler, Pa., *A7*; Wallingford, Conn., *U3* (.25¢ per lb higher) *W1* (.25¢ per lb higher); New Bedford, Mass., *R6*.

Bar: Baltimore, *A7*; Duquesne, Pa., *U1*; Munhall, Pa., *U1*; Reading, Pa., *C2*; Titusville, Pa., *U2*; Washington, Pa., *J2*; McKeesport, Pa., *U1*, *F1*; Bridgeville, Pa., *U2*; Dunkirk, N. Y., *A3*; Massillon, O., *R3*; Chicago, *U1*; Syracuse, N. Y., *C11*; Watervliet, N. Y., *A3*; Waukegan, *A5*; Canton, O., *T5*; Ft. Wayne, *I4*.

Wire: Waukegan, *A5*; Massillon, O., *R3*; McKeesport, Pa., *F1*; Ft. Wayne, *J4*; Harrison, N. J., *D3*; Baltimore, *A7*; Dunkirk, *A3*; Monessen, *P1*; Syracuse, *C11*; Bridgeville, *U2*.

Structurals: Baltimore, *A7*; Massillon, O., *R3*; Chicago, Ill., *J4*; Watervliet, N. Y., *A3*; Syracuse, *C11*

Plates: Brackenridge, Pa., *A3*; Chicago, *U1*; Munhall, Pa., *U1*; Midland, Pa., *C11*; New Castle, nd., *I2*; Middletown, *A7*; Washington, Pa., *J2*; Cleveland, Massillon, *R3*; Coatesville, Pa., *C15*.

Forged discs, die blocks, rings: Pittsburgh, *C11*; Syracuse, *C11*; Ferndale, Mich., *A3*; Washington, Pa *J2*.

Forging billets: Midland, Pa., *C11*; Baltimore, *A7*; Washington, Pa., *J2*; McKeesport, *F1*; Massillon Canton, O., *R3*; Watervliet, *A3*; Pittsburgh, Chicago, *U1*; Syracuse, *C11*.

Propose Stockpile Diversion

Government weighs diversion of copper from stockpile to alleviate tight market in fourth quarter . . . Approval keyed to Labor Dept. decision—By *R. L. Hatschek.*

◆ TIGHT fourth quarter copper market now shaping up as a result of labor difficulties both here and abroad may be eased by government action reported under consideration late last week. Idea is to divert fourth quarter stockpile shipments to regular market channels—but it may run into a Labor Dept. snag.

Office of Defense Mobilization and General Services Administration are studying two alternate methods: (1) Permit sale of copper now in the revolving fund of Emergency Procurement Service or (2) hold off fourth quarter stockpile deliveries.

Key to approval, however, is Labor Secretary Mitchell's opinion as to whether this move would be considered a strike-breaking activity by organized labor. Mr. Mitchell was taking his time making the decision as this issue went to press. Foremost in his mind is the possible effect the action might have on labor while the government is trying to negotiate a settlement.

Meanwhile, considerable doubt was expressed in copper trade circles that this stockpile diversion would be okayed.

COPPER . . . Bid price for spot copper in London rose to a high of 34.375¢ per lb last week before dipping back slightly. This indicates the tightness existing there as a result of strikebound production.

The Chilean situation was just about cleared up last week on rather drastic action by the government there but negotiations in the U. S. continued rather quietly. Overall labor picture in the U. S. showed little change and market tightness drove refiner and ingot maker scrap buying prices higher.

ALUMINUM . . . Still another American aluminum producer's name has come up in connection with Canadian water rights in the Pacific Northwest. This time it's Kaiser Aluminum & Chemical Corp. which has received permission to conduct a survey on the Columbia River in British Columbia.

Idea is not to produce electric power there but to construct a dam for storage of water. Reservoir would be tapped as needed to generate electricity downstream in the U. S.

Latest report on the part Reynolds Metals Co. is to play in the huge Frobisher, Ltd., scheme in the same province is considerably toned down from previous reports. Final decision on whether or not Reynolds takes any part may depend on what the engineers have to say. Many earlier reports, especially in the Canadian press, had it that the deal was all but signed. THE IRON AGE, however, indicated that it was still in the talking stage late last month.

Aluminum Co. of America last week reached agreement with the United Auto Workers, signing a new contract generally in line with those signed with other unions. The UAW represents workers at four Alcoa plants.

MERCURY . . . Still another new record price level for mercury was scored last week when the liquid metal hit a spot price of $323 to $329 per 76-lb flask. The scarcity is acute with no sign of possible abatement for at least a month. Production both in the U. S. and Mexico is currently being expanded following guarantee of $225 per flask by the U. S. government.

Cause of the shortage is reported as unknown by the government. While one Senate subcommittee claims that the European mercury cartel is stronger than ever, despite having been formally dissolved, there is an unexplained difference in quantity of imports and absorption of the metal by industry and government.

It is speculated in some quarters that Office of Defense Mobilization is buying heavily for atomic and hydrogen bomb projects and guided missile work. This, however, cannot be pinned down for obvious security reasons.

LEAD . . . Bureau of Mines reports lead consumption through July was almost 12 pct lower than in the first 7 months of 1953. Tonnages were 623,041 and 706,000, respectively. For the period, use by battery makers, cable manufacturers and pigment producers was off while consumption for tetraethyl lead increased.

As for the current market, sales have improved somewhat as consumers began to come in for October tonnages. Some sellers report a fair volume while others say sales have been light. London, meanwhile, maintained a slight edge over New York parity.

ZINC . . . Demand seems to be coasting along at a slightly improved —though far from heavy—clip. Tonnages have been getting better during the current month and reports on sales late last week were fairly good for Regular High Grade and Prime Western. The London market remains fairly steady at a level slightly under the New York equivalent price.

Stockpile buying is expected to start up again shortly but tonnages offered at the current 11.50 cents price are expected to be light. Sellers will prefer to hold off a bit and sell on an average price basis—the price can't go down.

Daily Nonferrous Metal Prices

(Cents per lb except as noted)

	Sept. 22	Sept. 23	Sept. 24	Sept. 25	Sept. 27	Sept. 28
Copper, electro, Conn.	30.00	30.00	30.00	30.00	30.00	30.00
Copper, Lake, delivered	30.00	30.00	30.00	30.00	30.00	30.00
Tin, Straits, New York	93.875	94.125	94.00	....	93.50	93.50*
Zinc, East St. Louis	11.50	11.50	11.50	11.50	11.50	11.50
Lead, St. Louis	14.55	14.55	14.55	14.55	14.55	14.55

Note: Quotations are going prices **Tentative*

Nonferrous Prices

(Effective Sept. 28, 1954)

MILL PRODUCTS

(Cents per lb, unless otherwise noted)

Aluminum

(Base 30,000 lb. f.o.b. ship. pt., frt. allowed)

Flat Sheet: 0.136-0.249 in., 2S, 3S, 34.9¢; 4S, 37.1¢; 52S, 39.2¢; 24S-O, 24S-OAL, 38.3¢; 75 S-O, 75S-OAL, 45.8¢; 0.081 in., 2S, 3S, 36.1¢; 4S, 38.8¢; 52S, 40.9¢; 24S-O, 24S-OAL, 39.8¢; 75S-O, 75S-OAL, 48.1¢; 0.032 in., 2S, 3S, 38.1¢; 4S, 43.0¢; 52S, 45.7¢; 24S-O, 24S-OAL, 48.4¢; 75S-O, 75S-OAL, 59.8¢.

Plate, ¼-in. and heavier: 2S-F, 3S-F, 33.6¢; 4S-F, 35.7¢; 52S-F, 37.4¢; 61S-O, 36.8¢; 24S-O, 24S-OAL, 38.4¢; 75S, 75S-OAL, 45.8¢.

Extruded Solid Shapes: Shape factors 1 to 5, 37.7¢ to 85.7¢; 12 to 14, 38.4¢ to $1.03; 24 to 26, 41.2¢ to $1.34; 36 to 38, 45.8¢ to $1.96.

Rod, Round: Rolled, 1.064-4.5 in., 2S-F, 42.6¢ to 39.1¢; cold finished, 0.375-3.499 in., 2S-F, 46.9¢ to 41.4¢.

Screw Machine Stock: Rounds, 11S-T3, ¼-11/32 in., 62.5¢ to 49.1¢; ⅜-1½ in., 48.9¢ to 45.9¢; 1 9/16-3 in., 44.7¢ to 41.7¢. Base 5000 lb.

Drawn Wire: Coiled, 0.051-0.374 in., 2S, 46.1¢ to 34.8¢; 52S, 55.7¢ to 43.4¢; 17S-T4, 63.3¢ to 43.7¢; 61S-T4, 58.5¢ to 43.1¢.

Extruded Tubing: Rounds, 63S-T5, OD 1¼-2 in., 43.4¢ to 63.8¢; 2-4 in., 39.3¢ to 53.6¢; 4-6 in., 39.8¢ to 48.8¢; 6-9 in., 40.4¢ to 51.1¢.

Roofing Sheet: Flat, per sheet, 0.032-in. 42¾ x 60-in., $2.918; x 96-in., $4.672; x 120-in., $5.841; x 144-in., $7.009. Coiled sheet, per lb, 0.019 in. x 28 in., 29.9¢.

Magnesium

(F.o.b. mill, freight allowed)

Sheet & Plate: FS1-O ⅛ in., 56¢; 3/16 in., 57¢; ¼ in., 60¢; 0.064 in., 73¢; 0.032 in., 94¢. Specification grade higher. Base 30,000 lb.

Extruded Round Rod: M, diam ¼ to 0.311 in., 77¢; ⅓ to ¾ in., 60.5¢; 1¼ to 1.749 in., 56¢; 2½ to 5 in., 51.5¢. Other alloys higher. Base up to ⅝ in. diam, 10,000 lb; ¾ to 2 in., 20,000 lb; 2 in. and larger, 30,000 lb.

Extruded Solid Shapes: Rectangles: M. In weight per ft, for perimeters less than size indicated; 0.10 to 0.11 lb, 3.5 in., 65.3¢; 0.22 to 0.25 lb, 5.9 in., 62.3¢; 0.50 to 0.59 lb, 8.6 in., 59.7¢; 1.8 to 2.59 lb, 19.5 in., 56.8¢; 4 to 6 lb, 28 in., 52¢. Other alloys higher. Base, in weight per ft of shape: Up to ½ lb, 10,000 lb; ½ to 1.80 lb, 20,000 lb; 1.80 lb and heavier, 30,000 lb.

Extruded Round Tubing: M, 0.049 to 0.057 in. wall thickness: OD ¼ to 5/16 in., $1.43; 5/16 to ⅝ in., $1.29; ½ to ⅝ in., 96¢; 1 to 2 in., 79¢; 0.165 to 0.219 in. wall; OD, ⅝ to ¾ in., 64¢; 1 to 2 in., 60¢; 3 to 4 in., 59¢. Other alloys higher. Base, OD: Up to 1½ in., 10,000 lb; 1½ to 3 in., 20,000 lb; over 3 in., 30,000 lb.

Titanium

(10,000 lb base, f.o.b. mill)

Commercially pure and alloy grades; Sheets and strip, HR or CR, $15; Plate, HR, $12; Wire, rolled and/or drawn, $11; Bar, HR or forged, $6; Forgings, $6.

Nickel, Monel, Inconel

(Base prices, f.o.b. mill)

	"A" Nickel	Monel	Inconel
Sheet, CR	86½	67½	92½
Strip, CR	92½	70½	98½
Rod, bar	82½	65½	88½
Angles, HR	82½	65½	88½
Plate, HR	84½	66½	90½
Seamless tube	115½	100½	137½
Shot, blocks	....	60	....

Copper, Brass, Bronze

(Freight included on 500 lb)

	Sheet	Rods	Extruded Shapes
Copper	46.41	....	48.48
Copper, h-r	48.33	44.73	....
Copper, drawn	....	45.98	....
Low brass	44.47	44.41	....
Yellow brass	41.72	41.66	....
Red brass	45.44	45.38	....
Naval brass	45.76	40.07	....
Leaded brass	....	....	39.11
Com. bronze	46.95	46.89	....
Mang. bronze	49.48	43.62	45.18
Phos. bronze	66.58	67.08	....
Munts metal	43.96	39.77	41.02
Ni silver, 10 pct	55.36	....	62.63

Beryllium copper, CR, 1.9% Be, Base 2000 lb, f.o.b.

Strip	$1.68
Rod, bar, wire	1.65

PRIMARY METALS

(Cents per lb, unless otherwise noted)

Aluminum ingot, 99+%, 10,000 lb, freight allowed	22.20
Aluminum pig	20.50
Antimony, American, Laredo, Tex.	28.50
Beryllium copper, per lb conta'd be.	$40.00
Beryllium aluminum 5% Be, Dollars per lb contained Be	$72.75
Bismuth, ton lots	$2.25
Cadmium, del'd	$1.70
Cobalt, 97-99% (per lb)	$2.60 to $2.67
Copper, electro, Conn. Valley	30.00
Copper, Lake, delivered	30.00
Gold, U. S. Treas., per troy oz.	$35.00
Indium, 99.8%, dollars per troy oz.	$2.25
Iridium, dollars per troy oz.	$165 to $175
Lead, St. Louis	14.55
Lead, New York	14.70
Magnesium, 99.8+%, f.o.b. Freeport, Tex., 10,000 lb, pig	27.00
ingot	27.75
Magnesium, sticks, 100 to 500 lb,	46.00 to 48.00
Mercury, dollars per 76-lb flask, f.o.b. New York	$323 to $329
Nickel electro, f.o.b. N. Y. warehouse	63.08
Nickel oxide sinter, at Copper Creek, Ont., contained nickel	56.25
Palladium, dollars per troy oz.	$21.00
Platinum, dollars per troy oz.	$84 to $87
Silver, New York, cents per troy oz.	85.25
Tin, New York	93.50
Titanium, sponge, grade A-1	$4.72
Zinc, East St. Louis	11.50
Zinc, New York	12.00
Zirconium copper, 50 pct.	$6.20

REMELTED METALS

Brass Ingot

(Cents per lb delivered, carloads)

85-5-5-5 ingot	
No. 115	28.50
No. 120	27.75
No. 123	27.25
80-10-10 ingot	
No. 305	33.00
No. 315	30.75
88-10-2 ingot	
No. 210	41.75
No. 215	38.25
No. 245	33.75
Yellow ingot	
No. 405	24.25
Manganese bronze	
No. 421	26.75

Aluminum Ingot

(Cents per lb del'd 30,000 lb and over)

95-5 aluminum-silicon alloys	
0.30 copper, max.	23.50-23.75
0.60 copper, max.	23.25-23.50
Piston alloys (No. 122 type)	20.75-22.00
No. 12 alum. (No. 2 grade)	20.25
108 alloy	21.00-21.25
195 alloy	22.00-22.25
13 alloy (0.60 copper max.)	23.25-23.50
ASX-679	21.00-21.25

Steel deoxidizing aluminum, notch-bar granulated or shot

Grade 1—96-97½%	20.75-21.75
Grade 2—92-95%	19.75-20.75
Grade 3—90-92%	18.75-19.75
Grade 4—85-90%	17.75-18.75

ELECTROPLATING SUPPLIES

Anodes

(Cents per lb, freight allowed, 5000 lb lots)

Copper	
Cast, oval, 15 in. or longer	42.64
Electrodeposited	41.88
Flat rolled	45.04
Brass, 80-20	
Cast, oval, 15 in. or longer	43.515
Zinc, flat cast	20.25
Ball, anodes	18.50
Nickel, 99 pct plus	
Cast	84.00
Cadmium	$1.70
Silver 999 fine, rolled, 100 oz. lots per troy oz., f.o.b. Bridgeport, Conn.	94⅛

Chemicals

(Cents per lb, f.o.b. shipping points)

Copper cyanide, 100 lb drum	63.00
Copper sulphate, 99.5 crystals, bbl.	12.85
Nickel salts, single or double, 4-100 lb bags, frt. allowed	30.00
Nickel chloride, 375 lb drum	38.00
Silver cyanide, 100 oz. lots, per oz.	75½
Sodium cyanide, 96 pct domestic 200 lb drums	19.25
Zinc cyanide, 100 lb drum	54.30

SCRAP METALS

Brass Mill Scrap

(Cents per pound, add 1¢ per lb for shipments of 20,000 lb and over)

	Heavy	Turnings
Copper	26	25¼
Yellow brass	19¾	18
Red brass	23	22¼
Comm. bronze	23¼	23½
Mang. bronze	18¼	17½
Yellow brass rod ends	19½	....

Custom Smelters' Scrap

(Cents per pound carload lots, delivered to refinery)

No. 1 copper wire	27¾—28
No. 2 copper wire	26½—26½
Light copper	24½—25
*Refinery brass	24½—25

*Dry copper content.

Ingot Makers' Scrap

(Cents per pound carload lots, delivered to refinery)

No. 1 copper wire	27 —27¼
No. 2 copper wire	25½—25¾
Light copper	24 —24¼
No. 1 composition	22 —22¼
No. 1 comp. turnings	21½
Rolled brass	17½—18
Brass pipe	18½—19
Radiators	18¼—18½
Aluminum	
Mixed old cast	14
Mixed new clips	14¼—14½
Mixed turnings, dry	14 —14¼
Pots and pans	14

Dealers' Scrap

(Dealers' buying price, f.o.b. New York in cents per pound)

Copper and Brass

No. 1 heavy copper and wire	24¾—25⅛
No. 2 heavy copper and wire	23½—23¾
Light copper	21¼—21½
New type shell cuttings	21½
Auto radiators (unsweated)	16 —16½
No. 1 composition	19⅛
No. 1 composition turnings	19
Unlined red car boxes	16½
Cocks and faucets	16½—17
Mixed heavy yellow brass	13½
Old rolled brass	16
Brass pipe	17
New soft brass clippings	18
Brass rod ends	16
No. 1 brass rod turnings	15

Aluminum

Alum. pistons and struts	7 — 8
Aluminum crankcases	11
2S aluminum clippings	14½
Old sheet and utensils	11
Borings and turnings	7 — 7½
Misc. cast aluminum	11
Dural clips (24S)	12¼

Zinc

New zinc clippings	7
Old zinc	5½
Zinc routings	3½— 3¾
Old die cast scrap	3¼— 3½

Nickel and Monel

Pure nickel clippings	60 —65
Clean nickel turnings	40
Nickel anodes	60 —65
Nickel rod ends	60 —65
New Monel clippings	23 —25
Clean Monel turnings	16 —18
Old sheet Monel	21 —23
Nickel silver clippings, mixed	15
Nickel silver turnings, mixed	13

Lead

Soft scrap lead	11¾
Battery plates (dry)	6¼— 6½
Batteries, acid free	4¼— 4½

Magnesium

Segregated solids	18½—19
Castings	17½—18

Miscellaneous

Block tin	75 —80
No. 1 pewter	55 —60
No. 1 auto babbitt	48
Mixed common babbitt	12 —12½
Solder joints	17½
Siphon tops	45
Small foundry type	16½
Monotype	15
Lino. and stereotype	14
Electrotype	12½
Hand picked type shells	9½
Lino. and stereo. dross	6⅛
Electro dross	5

Scrap Traders Stay Bullish

Dealers, brokers confident of more mill buying . . . Several areas report price advances . . . Detroit openhearth grades rise . . . Cast, turnings trend up.

◆ BULLISHNESS continued to dominate dealer and broker thinking this week. Scrap was strong, and price advances for various grades were reported in several areas, although in most cases they were not reflected in openhearth prices at press time. THE IRON AGE Scrap Composite Price is unchanged at $30.17.

Brokers in Chicago and Pittsburgh are reported to be paying higher prices than they are receiving to cover old orders. Automotive and other industrial lists closing in the Midwest this week raised Detroit openhearth prices. And one large Pittsburgh consumer is said to be having trouble placing orders at present prices.

Exports continue to dominate business in the East and South, with domestic buying trailing the foreign orders. Importance of exports in trade thinking is shown by expansion of waterside facilities by at least two New York brokers, one reportedly on a 10-year lease.

Demand and prices for cast grades are up in several areas. Foundry activity is definitely quickening, with stepped-up buying of both scrap and pig iron. And increased pig iron and hot metal demand has boosted blast furnace operation, raised turnings prices.

Pittsburgh . . . The market assumed a stronger tone this week. A large consumer was expected to purchase a tonnage for one of its district mills. And reports indicated the consumer was meeting resistance in its attempts to buy at current quotations. Some brokers are said to be paying as high as $32 to fill an earlier $31 order. Cupola cast moved up $2 per ton on basis of a sale, heavy breakable cast was up $1. Other prices were firm but unchanged.

Chicago . . . With little support in mill buying, Chicago scrap continued to move upward. Consumer prices, pegged last week by small tonnage sales, failed to halt the upward movement of dealer prices. Filling orders placed on old prices at over the old price is reported with increasing frequency. Grades, as cast iron borings, that were notoriously bad movers a few weeks ago, now are being held as money in the bank, in the confident expectation that the grade will continue to move up. There has been broker buying of this particular grade at above the consumer delivered price for at least a week. Turnings rose $2 during the week.

Philadelphia . . . Openhearth grades maintained solid strength without any price increases as export business continued and local mills began asking about more tonnage. Chemical borings and low phos grades went up $1 and $2 per ton respectively on new sales. Some sources indicated a feeling that steelmaking scrap would rise shortly.

New York . . . Continued export demand raised steelmaking grades $1 to $2 per ton this week. And brokers are reportedly paying healthy premiums for large quantities. Five ships are now loading in New York, and at least two brokers are expanding waterside yards in expectation of continuance of export business for some time to come. The trade expects domestic buying in the very near future, predicts prices will go higher, particularly for No. 1 material.

Detroit . . . All eyes in Detroit were on automotive lists that closed at intervals during the week. The trade hoped that the feeling of strength would be reflected immediately in increased prices, but had to mark time until the pattern was established by list bidding and followup orders to dealers. Cast continued firm and prices advanced $1.

Cleveland . . . Dealers' biggest concern last week was getting World Series tickets for customers while scrap market stayed firm but unchanged for moment. Bidding on Detroit industrial lists this week was expected to be at least $1 per ton higher due to dealer belief in stronger fall market and lesser tonnages offered. Valley market still building up strength and expected to rise this week but no major sales consummated.

Birmingham . . . The market in this district is extremely bullish and brokers and dealers are predicting further price increases as steel production increases. Many dealers are holding down the amount of orders they will accept even at the increased prices announced in recent weeks. Export quotations for Carolina ports were reported up $1 for No. 1 steel and generally firmer due to imminent arrival of boats.

St. Louis . . . Railroad lists which closed during the week sold readily but without any advance in prices as there was no higher speculative buying. A leading melter moved up its price of No. 1 heavy melting $3 per ton but this did not affect other dealer items.

Cincinnati . . . Steel scrap market continued unchanged at the start of the week. But higher bids are expected on industrial lists closing this week.

Buffalo . . . A delayed flurry in boat receipts of scrap has followed recent price advances. Limited new supplies and higher steel production rate are bullish factors. Four boat loads with approximately 15,000 tons have arrived from Upper Lakes. Strength dominates market.

Boston . . . Though stronger sentiments are felt in the New England scrap trade this week they haven't asserted themselves in the form of higher prices. Only buying of any real significance in this area continues to be for export.

West Coast . . . Cast scrap moving in San Francisco in snappy fashion —now $43-$46 per ton. Steady, but at lower prices, in Seattle and Los Angeles. Small San Francisco mill still on strike but small Los Angeles mill back to work.

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EXPORTS - IMPORTS — LIVINGSTON & SOUTHARD, INC., 99 Park Avenue, New York, N. Y. *Cable Address:* FORENTRACO

Scrap Prices

(Effective Sept. 28, 1954)

Pittsburgh

No. 1 hvy. melting	$31.00 to $32.00
No. 2 hvy. melting	28.00 to 29.00
No. 1 bundles	31.00 to 32.00
No. 2 bundles	25.00 to 26.00
Machine shop turn.	16.00 to 17.00
Mixed bor. and ms. turns.	16.00 to 17.00
Shoveling turnings	20.00 to 21.00
Cast iron borings	19.00 to 20.00
Low phos. punch'gs, plate	34.00 to 35.00
Heavy turnings	28.00 to 29.00
No. 1 RR. hvy. melting	33.00 to 34.00
Scrap rails, random lgth.	37.00 to 38.00
Rails 2 ft and under	43.00 to 44.00
RR. steel wheels	35.00 to 36.00
RR. spring steel	35.00 to 36.00
RR. couplers and knuckles	35.00 to 36.00
No. 1 machinery cast.	42.00 to 43.00
Cupola cast.	37.00 to 38.00
Heavy breakable cast.	31.00 to 32.00

Chicago

No. 1 hvy. melting	$30.00 to $31.00
No. 2 hvy. melting	28.00 to 29.00
No. 1 factory bundles	32.00 to 33.00
No. 1 dealers' bundles	30.00 to 31.00
No. 2 dealers' bundles	22.00 to 23.00
Machine shop turn.	16.00 to 17.00
Mixed bor. and turn.	18.00 to 19.00
Shoveling turnings	18.00 to 19.00
Cast iron borings	18.00 to 19.00
Low phos. forge crops	37.00 to 38.00
Low phos. punch'gs, plate	34.00 to 36.00
Low phos. 3 ft and under	33.00 to 34.00
No. 1 RR. hvy. melting	33.00 to 34.00
Scrap rails, random lgth.	40.00 to 41.00
Rerolling rails	49.00 to 51.00
Rails 2 ft and under	47.00 to 48.00
Locomotive tires, cut	34.00 to 35.00
Cut bolsters & side frames	36.00 to 37.00
Angles and splice bars	39.00 to 40.00
RR. steel car axles	48.00 to 49.00
RR. couplers and knuckles	36.00 to 37.00
No. 1 machinery cast.	42.00 to 43.00
Cupola cast.	39.00 to 40.00
Heavy breakable cast.	32.00 to 33.00
Cast iron brake shoes	33.00 to 34.00
Cast iron car wheels	35.00 to 36.00
Malleable	41.00 to 43.00
Stove plate	31.00 to 33.00

Philadelphia Area

No. 1 hvy. melting	$28.00 to $29.00
No. 2 hvy. melting	26.00 to 27.00
No. 1 bundles	28.00 to 29.00
No. 2 bundles	22.00 to 23.00
Machine shop turn.	15.50 to 16.50
Mixed bor. short turn.	18.00 to 19.00
Cast iron borings	18.00 to 19.00
Shoveling turnings	19.00 to 20.00
Clean cast chem. borings	23.00 to 24.00
Low phos. 5 ft and under	31.00 to 32.00
Low phos. 2 ft and under	32.00 to 33.00
Low phos. punch'gs	32.00 to 33.00
Elec. furnace bundles	30.00 to 31.00
Heavy turnings	26.00 to 27.00
RR. steel wheels	32.00 to 33.00
RR. spring steel	32.00 to 33.00
Rails 18 in. and under	43.00 to 44.00
Cupola cast.	34.00 to 35.00
Heavy breakable cast.	35.00 to 36.00
Cast iron carwheels	38.00 to 39.00
Malleable	36.00 to 37.00
Unstripped motor blocks	27.00 to 28.00
No. 1 machinery cast.	40.00 to 42.00
Charging box cast.	36.00 to 37.00

Cleveland

No. 1 hvy. melting	$30.00 to $31.00
No. 2 hvy. melting	29.00 to 30.00
No. 1 bundles	30.00 to 31.00
No. 2 bundles	25.50 to 26.50
No. 1 busheling	30.00 to 31.00
Machine shop turn.	13.00 to 14.00
Mixed bor. and turn.	.... 18.00
Shoveling turnings	.... 18.00
Cast iron borings	.... 18.00
Cut struct'r'l & plates, 2 ft & under	34.00 to 35.00
Drop forge flashings	29.00 to 30.00
Low phos. 2 ft & under	30.00 to 32.00
No. 1 RR. heavy melting	30.00 to 31.00
Rails 3 ft and under	45.00 to 46.00
Rails 18 in. and under	46.00 to 47.00
Railroad grate bars	27.00 to 28.00
Steel axle turnings	19.00 to 20.00
Railroad cast.	43.00 to 44.00
No. 1 machinery cast.	43.00 to 44.00
Stove plate	34.00 to 35.00
Malleable	43.00 to 44.00

Iron and Steel Scrap

Going prices of iron and steel scrap as obtained in the trade by THE IRON AGE based on representative tonnages. All prices are per gross ton delivered to consumer unless otherwise noted.

Youngstown

No. 1 hvy. melting	$31.00 to $32.00
No. 2 hvy. melting	26.00 to 27.00
No. 1 bundles	31.00 to 32.00
No. 2 bundles	23.00 to 24.00
Machine shop turn.	14.00 to 15.00
Shoveling turnings	19.00 to 20.00
Cast iron borings	19.00 to 20.00
Low phos. plate	32.00 to 33.00

Buffalo

No. 1 hvy. melting	$28.00 to $29.00
No. 2 hvy. melting	22.50 to 23.50
No. 1 busheling	28.00 to 29.00
No. 1 bundles	28.00 to 29.00
No. 2 bundles	20.50 to 21.50
Machine shop turn.	15.00 to 16.00
Mixed bor. and turn.	18.00 to 19.00
Shoveling turnings	18.50 to 19.50
Cast iron borings	18.00 to 19.00
Low phos. plate	30.00 to 31.00
Scrap rails, random lgth.	33.00 to 34.00
Rails 2 ft and under	40.00 to 41.00
RR. steel wheels	34.00 to 35.00
RR. spring steel	34.00 to 35.00
RR. couplers and knuckles	34.00 to 35.00
No. 1 machinery cast.	39.00 to 40.00
No. 1 cupola cast.	25.00 to 36.00

Detroit

Brokers buying prices per gross ton, on cars:

No. 1 hvy. melting	$24.00 to $25.00
No. 2 hvy. melting	21.00 to 22.00
No. 1 bundles, openhearth	26.00 to 27.00
No. 2 bundles	19.00 to 20.00
New busheling	24.00 to 25.00
Drop forge flashings	24.00 to 25.00
Machine shop turn.	11.00 to 12.00
Mixed bor. and turn.	13.00 to 14.00
Shoveling turnings	13.50 to 14.50
Cast iron borings	13.50 to 14.50
Low phos. punch'gs, plate	25.00 to 26.00
No. 1 cupola cast.	.... 34.00
Heavy breakable cast.	.... 25.00
Stove plate	.... 30.00
Automotive cast.	.... 38.00

St. Louis

No. 1 hvy. melting	$29.00 to $30.00
No. 2 hvy. melting	24.50 to 25.50
No. 1 bundles	26.00 to 27.00
No. 2 bundles	20.50 to 21.50
Machine shop turn.	13.50 to 14.00
Cast iron borings	14.00 to 15.00
Shoveling turnings	15.00 to 16.00
No. 1 RR. hvy. melting	32.50 to 33.50
Rails, random lengths	35.00 to 36.00
Rails, 18 in. and under	43.00 to 44.00
Locomotive tires, uncut	32.00 to 33.00
Angles and splice bars	34.00 to 35.00
Std. steel car axles	35.00 to 36.00
RR. spring steel	32.00 to 33.00
Cupola cast	42.00 to 43.00
Hvy. breakable cast.	31.00 to 32.00
Cast iron brake shoes	26.00 to 27.00
Stove plate	36.50 to 37.50
Cast iron car wheels	32.00 to 33.00
Malleable	35.00 to 36.00
Unstripped motor blocks	30.00 to 31.00

New York

Brokers buying prices per gross ton, on cars:

No. 1 hvy. melting	$23.00 to $25.00
No. 2 hvy. melting	21.00 to 22.00
No. 2 bundles	16.00 to 17.00
Machine shop turn.	7.00 to 8.00
Mixed bor. and turn.	9.00 to 10.00
Shoveling turnings	11.50 to 12.50
Clean cast chem. borings	18.00 to 19.00
No. 1 machinery cast.	35.00 to 36.00
Mixed yard cast.	29.00 to 30.00
Charging box cast.	29.00 to 30.00
Heavy breakable cast.	27.00 to 28.00
Unstripped motor blocks	22.00 to 23.00

Birmingham

No. 1 hvy. melting	$23.50 to $24.50
No. 2 hvy. melting	.... 22.50
No. 1 bundles	.... 23.50
No. 2 bundles	17.00 to 18.00
No. 1 busheling	.... 23.50
Machine shop turn.	15.00 to 16.00
Shoveling turnings	16.00 to 17.00
Cast iron borings	16.00 to 17.00
Electric furnace bundles	28.00 to 29.00
Bar crops and plate	30.50 to 31.50
Structural and plate, 2 ft	30.50 to 31.50
No. 1 RR. hvy. melting	28.00 to 29.00
Scrap rails, random lgth.	35.00 to 36.00
Rails, 18 in. and under	39.00 to 40.00
Angles & splice bars	37.50 to 38.50
Rerolling rails	40.00 to 41.00
No. 1 cupola cast.	45.00 to 46.00
Stove plate	42.00 to 43.00
Charging box cast.	19.00 to 20.00
Cast iron car wheels	33.00 to 34.00
Unstripped motor blocks	35.00 to 36.00
Mashed tin cans	15.00 to 16.00

Boston

Brokers buying prices per gross ton, on cars:

No. 1 hvy. melting	$19.00 to $20.00
No. 2 hvy. melting	14.00 to 15.00
No. 1 bundles	19.00 to 20.00
No. 2 bundles	14.00 to 15.00
No. 1 busheling	19.00 to 20.00
Elec. furnace, 3 ft & under	19.00 to 20.00
Machine shop turn.	5.00 to 6.00
Mixed bor. and short turn.	9.00 to 10.00
Shoveling turnings	10.00 to 11.00
Clean cast chem. borings	13.00 to 14.00
No. 1 machinery cast.	29.00 to 30.00
Mixed cupola cast.	26.00 to 27.00
Heavy breakable cast.	25.00 to 25.50
Stove plate	25.00 to 26.00
Unstripped motor blocks	17.00 to 18.00

Cincinnati

Brokers buying prices per gross ton, on cars:

No. 1 hvy. melting	$25.50 to $26.50
No. 2 hvy. melting	22.50 to 23.50
No. 1 bundles	26.00 to 27.00
No. 2 bundles	20.00 to 21.00
Machine shop turn.	12.00 to 13.00
Mixed bor. and turn.	14.00 to 15.00
Shoveling turnings	14.50 to 15.50
Cast iron borings	14.50 to 15.50
Low phos., 18 in. & under	33.00 to 34.00
Rails, random lengths	36.00 to 37.00
Rails, 18 in. and under	44.00 to 45.00
No. 1 cupola cast.	38.00 to 39.00
Hvy. breakable cast.	34.00 to 35.00
Drop broken cast.	43.00 to 44.00

San Francisco

No. 1 hvy. melting	.... $20.00
No. 2 hvy. melting	.... 16.00
No. 1 bundles	.... 19.00
No. 2 bundles	.... 16.00
No. 3 bundles	.... 12.00
Machine shop turn.	.... 5.00
Cast iron borings	.... 8.00
No. 1 RR. hvy. melting	.... 20.00
No. 1 cupola cast.	$43.00 to 46.00

Los Angeles

No. 1 hvy. melting	.... $20.00
No. 2 hvy. melting	.... 16.00
No. 1 bundles	.... 19.00
No. 2 bundles	$15.50 to 16.00
No. 3 bundles	.... 12.00
Machine shop turn.	.... 5.00
Shoveling turnings	7.00 to 9.00
Cast iron borings	7.00 to 9.00
Elec. fur. 1 ft and under	.... 25.00
No. 1 RR. hvy. melting	.... 20.00
No. 1 cupola cast.	40.00 to 42.00

Seattle

No. 1 hvy. melting	.... $25.00
No. 2 hvy. melting	.... 21.00
No. 1 bundles	.... 21.50
No. 2 bundles	.... 17.00
No. 3 bundles	.... 13.00
No. 1 cupola cast.	.... 35.00
Mixed yard cast.	.... 35.00

Hamilton, Ont.

No. 1 hvy. melting	.... $22.00
No. 2 hvy. melting	.... 19.00
No. 1 bundles	.... 22.00
No. 2 bundles	.... 19.00
Mixed steel scrap	.... 16.00
Bushelings	.... 17.00
Bush., new fact prep'd	.... 20.00
Bush., new fact unprep'd	.... 16.00
Short steel turnings	.... 13.00
Mixed bor. and turn.	.... 13.00
Rails, remelting	.... 31.00
Cast scrap	$42.00 to 45.00

Announcing ...New **Ohio** Shop-Lifter

SELF-CONTAINED, BATTERY-OPERATED MAGNET FOR IN-PLANT USE

Ohio Shop-Lifter Magnet is the newest, latest thing for magnetically handling high-density loads such as large chunks or machined parts. Powered by long-life, self-contained batteries, it can be used indoors because it eliminates the dangers of sudden power failure.

Powerful? Lifts up to 2000 pounds. *Light?* Weighs only 120 pounds; ideal for use on lift trucks or portable shop hoists. *Maintenance?* Batteries last five to 12 average work shifts without recharging. Remote control optional.

Call or write Ohio Electric for information on the new Ohio Shop-Lifter and request Catalog 113.

AA-244

OHIO WELDED MAGNETS. 39 to 65" diameter. Lightweight models in 39 & 45". 6-coil types in 46, 55, 65"; 8-coil in 55 & 65". Weld on top where it can't get dented in. Also capsule coil over 45".

Ohio gives prompt service in rebuilding and reconditioning magnets

OHIO BOLTED MAGNETS. 12 to 65" diameter. 6-coil types in 39 to 65"; 8-coil in 55 & 65". Strap copper coils over 39". Bolts protected in recessed wells. Also capsule coil over 45".

OHIO BASKET MAGNETS. 55 & 65" 4-coil, & 65" 6-coil. For extra heavy-duty service; hefty ears project beyond magnet diameter, ward off damaging blows. No weight carried by bolts. Also capsule coil over 45".

CHESTER BLAND
President

ohio ELECTRIC

THE OHIO ELECTRIC MFG. CO.

5400 Dunham Rd. • Maple Heights • Cleveland, Ohio

IRON AGE

STEEL PRICES

(Effective Sept. 28, 1954)

Italics identify producers listed in key at end of table. Base prices, f.o.b. mill, in cents per lb., unless otherwise noted. Extras apply.

		BILLETS, BLOOMS, SLABS			PIL-ING	SHAPES STRUCTURALS			STRIP					
		Carbon Rerolling Net Ton	Carbon Forging Net Ton	Alloy Net Ton	Sheet Steel	Carbon	Hi Str. Low Alloy	Carbon Wide-Flange	Hot-rolled	Cold-rolled	Hi Str. H.R. Low Alloy	Hi Str. C.R. Low Alloy	Alloy Hot-rolled	Alloy Cold-rolled
EAST	Bethlehem, Pa.			$86.00 *B3*		4.30 *B3*	6.45 *B3*	4.30 *B3*						
	Buffalo, N. Y.	$64.00 *B3*	$78.00 *B3, R3*	$86.00 *B3, R3*	5.075 *B3*	4.30 *B3*	6.45 *B3*	4.30 *B3*	4.05 *B3,R3*	5.75 *B3,R7*	6.15 *B3*	8.425 *B3*		
	Claymont, Del.													
	Coatesville, Pa.													
	Conshohocken, Pa.								4.175 *A2*		6.15 *A2*			
	New Bedford, Mass.									6.20 *R6*				
	Harrison, N. J.													
	Johnstown, Pa.	$64.00 *B3*	$78.00 *B3*	$86.00 *B3*		4.30 *B3*	6.45 *B3*		4.05 *B3*					
	Fairless, Pa.													
	New Haven, Conn.									6.20 *D1* 6.50 *A5*				
	Phoenixville, Pa.					3.95 *P2*		3.95 *P2*						
	Sparrows Pt., Md.								4.05 *B3*	5.75 *B3*	6.15 *B3*	8.425 *B3*		
	Wallingford, Conn.									6.20 *W1*				
	Worcester, Mass. Pawtucket, R. I.									6.30 *N7* 6.60 *A5*				12.75 *A5* 12.80 *N7*
MIDDLE WEST	Alton, Ill.								4.225 *L1*					
	Ashland, Ky.								4.05 *A7*					
	Canton-Massillon, Dover, Ohio		$88.00 *R3*	$82.00 *T5* $86.00 *R3*										12.45 *C6*
	Chicago, Ill.	$64.00 *U1*	$78.00 *R3, U1,W8*	$86.00 *U1, W8,R3*	5.075 *U1*	4.25 *U1, W8*	6.40 *U1, Y1*	4.25 *U1*	4.05 *A1,N4, W8*	5.85 *A1*				
	Cleveland, Ohio									5.75 *A5,J3*		8.60 *A5*		12.45 *A5*
	Detroit, Mich.			$86.00 *R5*					4.20 *G3,M2*	5.90 *D1,D2, G3,M2,P11*	6.30 *G3*	8.75 *D2, G3*		
	Duluth, Minn.													
	Gary, Ind. Harbor, Indiana	$64.00 *U1*	$78.00 *U1*	$86.00 *U1, Y1*	5.075 *I3*	4.25 *I3, U1*	6.40 *U1, I3*		4.05 *I3, U1,Y1*	6.00 *I3*	6.15 *U1, I3,Y1*	8.60 *Y1*	6.70 *U1, Y1*	
	Sterling, Ill.								4.15 *N4*					
	Indianapolis, Ind.									5.90 *C3*				
	Newport, Ky.												6.70 *N5*	
	Middletown, Ohio									5.75 *A7*				
	Niles, Warren, Ohio Sharon, Pa.								4.05 *S1,R3*	5.75 *S1,R3, T4*	6.15 *S1, R3*	8.60 *S1,R3*	6.70 *S1*	12.45 *S1*
	Pittsburgh, Pa. Midland, Pa. Butler, Pa.	$64.00 *U1, J3*	$78.00 *J3, U1,C11*	$86.00 *U1, C11*	5.075 *U1*	4.25 *J3, U1*	6.40 *J3, U1*	4.25 *U1*	4.05 *S7,P6*	5.75 *B4,J3 S7*			6.70 *S9*	12.45 *S9*
	Portsmouth, Ohio								4.05 *P7*	5.75 *P7*				
	Weirton, Wheeling, Follansbee, W. Va.					4.25 *W3*			4.05 *W3*	5.75 *F3, W3*	6.15 *W3*	8.60 *W3*		
	Youngstown, Ohio		$78.00 *C10*	$86.00 *Y1, C10*		4.25 *Y1*	6.40 *Y1*		4.05 *U1,Y1*	5.75 *Y1,C5*	6.15 *U1, Y1*	8.60 *Y1*	6.70 *U1, Y1*	12.45 *C5*
WEST	Fontana, Cal.	$72.00 *K1*	$86.00 *K1*	$105.00 *K1*		4.90 *K1*	7.05 *K1*	5.25 *K1*	4.825 *K1*	7.65 *K1*	7.25 *K1*		8.10 *K1*	14.55 *K1*
	Geneva, Utah		$78.00 *C7*			4.25 *C7*	6.40 *C7*							
	Kansas City, Mo.					4.85 *S2*	7.00 *S2*		4.65 *S2*				7.30 *S2*	
	Los Angeles, Torrance, Cal.		$87.50 *B2*	$106.00 *B2*		4.95 *B2, C7*	7.10 *B2*		4.80 *B2,C7*	7.80 *C1*				
	Minnequa, Colo.					4.70 *C6*			5.15 *C6*					
	San Francisco, Niles, Pittsburg, Cal.		$87.50 *B2*			4.90 *B2* 4.95 *P9*	7.05 *B2*		4.80 *B2,C7*					
	Seattle, Wash.		$91.50 *B2*			5.00 *B2*	7.15 *B2*		5.05 *B2, P12*					
SOUTH	Atlanta, Ga.								4.25 *A8*					
	Fairfield, Ala. City, Birmingham, Ala.	$64.00 *T2*	$78.00 *T2*			4.25 *T2,C16* 4.28 *R3*	6.40 *T2*		4.05 *R3, T2,C16*		6.15 *T2*			
	Houston, Tex.		$85.00 *S2*	$93.00 *S2*		4.65 *S2*	6.85 *S2*		4.45 *S2*				7.10 *S2*	

IRON AGE

STEEL PRICES

(Effective Sept. 28, 1954)

Italics identify producers listed in key at end of table. Base prices, f.o.b. mill, in cents per lb., unless otherwise noted. Extras apply.

		SHEETS									WIRE ROD	TINPLATE†		BLACK PLATE
		Hot-rolled *18* ga. & hvyr.	Cold-rolled	Galvanized *10* ga.	Enameling *12* ga.	Long Terne *10* ga.	Hi Str. Low Alloy H.R.	Hi Str. Low Alloy C.R.	Hi Str. Low Alloy Galv.	Hot-rolled *19* ga.		Coke* *1.25*-lb. base box	Electro* *0.25*-lb. base box	Holloware Enameling *29* ga.
EAST	Bethlehem, Pa.													
	Buffalo, N. Y.	4.05 *B3*	4.95 *B3*				6.10 *B3*	7.50 *B3*			4.675 *W6*			
	Claymont, Del.													
	Coatesville, Pa.													
	Conshohocken, Pa.	4.10 *A2*					6.15 *A2*							
	Harrisburg, Pa.													
	Hartford, Conn.													
	Johnstown, Pa.										4.675 *B3*			
	Fairless, Pa.	4.10 *U1*	5.00 *U1*				6.15 *U1*	7.55 *U1*				$8.80 *U1*	$7.50 *U1*	
	New Haven, Conn.													
	Phoenixville, Pa.													
	Sparrows Pt., Md.	4.05 *B3*	4.95 *B3*	5.45 *B3*			6.10 *B3*	7.50 *B3*	8.20 *B3*		4.775 *B3*	$8.80 *B3*	$7.50 *B3*	
	Worcester, Mass.										4.975 *A5*			
	Trenton, N. J.													
MIDDLE WEST	Alton, Ill.										4.85 *L1*			
	Ashland, Ky.	4.05 *A7*		5.45 *A7*	5.375 *A7*									
	Canton-Massillon, Dover, Ohio			5.45 *R1,R3*						5.175 *R1*				
	Chicago, Joliet, Ill.	4.05 *A1, W8*					6.10 *U1*				4.675 *A5, N4,R3*			
	Sterling, Ill.										4.775 *N4*			
	Cleveland, Ohio	4.05 *J3, R3*	4.95 *J3, R3*		5.375 *R3*		6.10 *J3, R3*	7.50 *J3, R3*			4.675 *A5*			
	Detroit, Mich.	4.20 *G3, M2*	5.10 *G3*				6.25 *G3*	7.65 *G3*						
	Newport, Ky.	4.05 *N5*		5.45 *N5*										
	Gary, Ind. Harbor, Indiana	4.05 *I3, U1,Y1*	4.95 *I3, U1,Y1*	5.45 *U1, I3*	5.375 *I3, U1*	5.85 *U1*	6.10 *U1,I3, Y1*	7.50 *U1,Y1*			4.675 *Y1*	$8.70 *I3, U1,Y1*	$7.40 *I3, U1,Y1*	6.10 *U1, Y1*
	Granite City, Ill.	4.25 *G2*	5.15 *G2*	5.65 *G2*	5.575 *G2*								$7.60 *G2*	6.30 *G2*
	Kokomo, Ind.	4.15 *C9*		5.55 *C9*						5.20 *C9*	4.775 *C9*			
	Mansfield, Ohio					5.85 *E2*				5.175 *E2*				
	Middletown, Ohio		4.95 *A7*		5.375 *A7*	5.85 *A7*								
	Niles, Ohio Sharon, Pa.	4.05 *S1,R3* 5.30 *N3*	4.95 *R3* 5.975 *N3*	5.45 *N3*	6.725 *N3*	5.85 *N3*	6.10 *S1,R3*	7.50 *R3*				$8.70 *R3*	$7.40 *R3*	
	Pittsburgh, Pa. Midland, Pa. Butler, Pa.	4.05 *J3, U1,P6*	4.95 *J3, U1,P6*	5.45 *U1*	5.375 *U1*		6.10 *J3, U1*	7.50 *J3, U1*	8.20 *U1*		4.675 *A5* 4.875 *P6*	$8.70 *J3, U1*	$7.40 *J3, U1*	6.10 *U1*
	Portsmouth, Ohio	4.05 *P7*	4.95 *P7*								4.675 *P7*			
	Weirton, Wheeling, Follansbee, W. Va.	4.05 *W3, W5*	4.95 *W3, W5,F3*	5.45 *W3, W5*		5.85 *W3, W5*	6.10 *W3*	7.50 *W3*				$8.70 *W3, W5*	$7.40 *W3, W5*	6.10 *F3, W5*
	Youngstown, Ohio	4.05 *U1, Y1*	4.95 *Y1*		5.375 *Y1*		6.10 *U1, Y1*	7.50 *Y1*			4.675 *Y1*			
WEST	Fontana, Cal.	4.825 *K1*	6.05 *K1*				6.875 *K1*	8.55 *K1*			5.475 *K1*			
	Geneva, Utah	4.15 *C7*					6.45 *C7*							
	Kansas City, Mo.													
	Los Angeles, Torrance, Cal.										5.475 *C7, B2*			
	Minnequa, Colo.										4.925 *C6*			
	San Francisco, Niles, Pittsburg, Cal.	4.75 *C7*	5.90 *C7*	6.20 *C7*							5.325 *C7*	$9.45 *C7*	$8.15 *C7*	
	Seattle, Wash.													
SOUTH	Atlanta, Ga.													
	Fairfield, Ala. Alabama City, Ala.	4.05 *R3, T2*	4.95 *T2*	5.45 *R3, T2*			6.10 *T2*			5.35 *R3*	4.675 *T2, R3*	$8.80 *T2*	$7.50 *T2*	
	[Houston, Texas	4.45 *S2*									5.075 *S2*			

† Special coated mfg. terne deduct 95¢ from 1.25-lb coke base box price. Can-making quality blackplate 55 to 128 lb deduct $2.20 from 1.25-lb coke base box.

* COKES: 1.50 lb add 25¢.

ELECTRO: 0.50-lb add 25¢; 0.75-lb add 65¢; 1.00-lb add $1.20.

IRON AGE

STEEL PRICES

(Effective Sept. 28, 1964)

Italics identify producers listed in key at end of table. Base prices, f.o.b. mill, in cents per lb., unless otherwise noted. Extras apply.

		BARS						PLATES				WIRE
		Carbon Steel	Reinforcing	Cold Finished	Alloy Hot-rolled	Alloy Cold Drawn	Hi Str. H.R. Low Alloy	Carbon Steel	Floor Plate	Alloy	Hi Str. Low Alloy	Mfg'rs. Bright
EAST	Bethlehem, Pa.				5.075 *B3*	6.625 *B3*	6.45 *B3*					
	Buffalo, N. Y.	4.30 *B3* 4.33 *R3*	4.30 *B3* 4.33 *R3*	5.45 *B5*	5.075 *B3* 5.105 *R3*	6.625 *B3,B5*	6.45 *B3*	4.225 *B3*			6.45 *B3*	5.75 *W6*
	Claymont, Del.							4.225 *C4*		5.80 *C4*		
	Conteaville, Pa.							4.225 *L4*		5.80 *L4*		
	Conshohocken, Pa.							4.225 *A2*	5.275 *A2*		6.45 *A2*	
	Harrisburg, Pa.							3.975 *C3*	5.275 *C3*			
	Hartford, Conn.			5.90 *R3*		6.925 *R3*						
	Johnstown, Pa.	4.30 *B3*	4.30 *B3*		5.075 *B3*		6.45 *B3*	4.225 *B3*		5.80 *B3*	6.45 *B3*	5.75 *B3*
	Fairless, Pa.	4.45 *U1*	4.45 *U1*		5.225 *U1*							
	Newark, N. J.			5.85 *W10*		6.80 *W10*						
	Camden, N. J.			5.85 *P10*								
	Putnam, Conn.			5.95 *W10*								
	Sparrows Pt., Md.		4.30 *B3*					4.225 *B3*		5.80 *B3*	6.45 *B3*	5.85 *B3*
	Palmer, Worcester, Readville, Mansfield, Mass.			5.85 *W11* 5.95 *B5,C14*		6.925 *A5,B5*						6.05 *A5, W6*
MIDDLE WEST	Alton, Ill.	4.50 *L1*										5.925 *L1*
	Ashland, Newport, Ky.							4.225 *A7,N5*		5.80 *N5*		
	Canton-Massillon, Mansfield, Ohio	4.46 *R3*		5.40 *R2* 5.44 *R3*	4.875 *T5* 5.115 *R3*	6.325 *T5* 6.625 *R2* 6.665 *R3*		4.225 *E2*				
	Chicago, Joliet, Ill.	4.30 *U1, N4,W8* 4.37 *R3*	4.30 *N4* 4.37 *R3*	5.40 *A5,W10, W8,B5,L2*	5.075 *U1, W8* 5.145 *R3*	6.625 *A5,W8, W10,L2, B5*		4.225 *U1,W8, I3,A1*	5.275 *U1*	5.80 *U1*	6.45 *U1*	5.75 *A5, R3,N4,W7*
	Cleveland, Ohio	4.36 *R3*	4.36 *R3*	5.40 *A5,C13*		6.625 *A5* 6.665 *C13*	6.45 *R3*	4.225 *J3* 4.285 *R3*	5.275 *J3*		6.45 *J3,R3*	5.75 *A5, C13*
	Detroit, Mich.	4.45 *R5,G3*		5.40 *R5* 5.60 *B5,P8* 5.65 *P3*	5.075 *R5* 5.225 *G3*	6.625 *R5* 6.825 *B5,P3, P8*	6.60 *G3*	4.375 *G3*			6.60 *G3*	
	Duluth, Minn.											5.75 *A5*
	Gary, Ind. Harbor, Crawfordsville	4.30 *I3, U1, Y1*	4.30 *I3, U1, Y1*	5.40 *M5* 5.47 *R3*	5.075 *I3, U1, Y1*	6.525 *M5* 6.695 *R3*	6.45 *U1,I3, Y1*	4.225 *I3, U1,Y1*	5.275 *I3*	5.80 *U1,Y1*	6.45 *U1,I3, Y1*	5.85 *M4*
	Granite City, Ill.							4.425 *G2*				
	Kokomo, Ind.											5.85 *C9*
	Sterling, Ill.	4.40 *N4*	4.40 *N4*									5.85 *N4*
	Niles, Ohio Sharon, Pa.	4.34 *R3*					6.45 *R3*	4.225 *S1*		5.80 *S1*	6.45 *S1*	
	Pittsburgh, Pa. Midland, Pa.	4.30 *J3, U1, C11*	4.30 *J3, U1*	5.40 *A5,C8,C11 J3,W10,B4* 5.46 *R3*	5.075 *U1,C11*	6.625 *A5,C11 W10,C8* 6.685 *R3*	6.45 *J3, U1*	4.225 *J3, U1*	5.275 *U1*	5.80 *U1*	6.45 *J3, U1*	5.75 *A5,J3, P6*
	Portsmouth, Ohio											5.75 *P7*
	Weirton, Wheeling, Follansbee, W. Va.	4.30 *W3*						4.225 *W3, W5*				
	Youngstown, Ohio	4.30 *U1,Y1,C10* 4.35 *R3*	4.30 *U1,Y1* 4.35 *R3*	5.40 *F2,Y1, C10*	5.075 *U1,Y1, C10*	6.625 *Y1,C10* 6.665 *F2*	6.45 *U1,Y1*	4.225 *U1,Y1*		5.80 *Y1*	6.45 *Y1*	5.75 *Y1*
WEST	Emeryville, Cal.	5.05 *J5*	5.05 *J5*									
	Fontana, Cal.	5.00 *K1*	5.00 *K1*		6.125 *K1*		7.70 *K1*	4.875 *K1*		6.45 *K1*	7.15 *K1*	
	Geneva, Utah							4.225 *C7*			6.45 *C7*	
	Kansas City, Mo.	4.90 *S2*	4.90 *S2*		5.675 *S2*		7.05 *S2*					6.35 *S2*
	Los Angeles, Torrance, Cal.	5.00 *B2,C7*	5.00 *B2,C7*	6.85 *R3*	6.125 *B2*		7.15 *B2*					6.70 *B2*
	Minnequa, Colo.	4.75 *C6*	4.75 *C6*					5.075 *C6*				5.90 *C6*
	Portland, Ore.	4.90 *O2*										
	San Francisco, Niles, Pittsburg, Cal.	5.00 *C7,P9* 5.05 *B2*	5.00 *C7,P9* 5.05 *B2*				7.20 *B2*					6.70 *C7*
	Seattle, Wash.	5.05 *B2,P12, N6*	5.05 *B2,P12*				7.20 *B2*	5.125 *B2*		6.70 *B2*	7.35 *B2*	
SOUTH	Atlanta, Ga.	4.50 *A8*	4.50 *A8*									5.95 *A8*
	Fairfield, Ala. City, Birmingham, Ala.	4.30 *T2,C16* 4.33 *R3*	4.30 *T2,C16* 4.33 *R3*				6.45 *T2*	4.225 *T2* 4.255 *R3*			6.45 *T2*	5.75 *R3, T2*
	Houston, Ft. Worth, Lone Star, Tex.	4.70 *S2*	4.70 *S2*		5.475 *S2*		6.85 *S2*	4.55 *L3* 4.625 *S2*		6.20 *S2*	6.85 *S2*	6.25 *S2*

Steel Prices

(Effective Sept. 28, 1954)

Key to Steel Producers

With Principal Offices

A1 Acme Steel Co., Chicago
A2 Alan Wood Steel Co., Conshohocken, Pa.
A3 Allegheny Ludlum Steel Corp., Pittsburgh
A4 American Cladmetals Co., Carnegie, Pa.
A5 American Steel & Wire Div., Cleveland
A6 Angell Nail & Chaplet Co., Cleveland
A7 Armco Steel Corp., Middletown, O.
A8 Atlantic Steel Co., Atlanta, Ga.

B1 Babcock & Wilcox Tube Div., Beaver Falls, Pa.
B2 Bethlehem Pacific Coast Steel Corp., San Francisco
B3 Bethlehem Steel Co., Bethlehem, Pa.
B4 Blair Strip Steel Co., New Castle, Pa.
B5 Bliss & Laughlin, Inc., Harvey, Ill.

C1 Calstrip Steel Corp., Los Angeles
C2 Carpenter Steel Co., Reading, Pa.
C3 Central Iron & Steel Co., Harrisburg, Pa.
C4 Claymont Products Dept., Claymont, Del.
C5 Cold Metal Products Co., Youngstown, O.
C6 Colorado Fuel & Iron Corp., Denver
C7 Columbia Geneva Steel Div., San Francisco
C8 Columbia Steel & Shafting Co., Pittsburgh
C9 Continental Steel Corp., Kokomo, Ind.
C10 Copperweld Steel Co., Pittsburgh, Pa.
C11 Crucible Steel Co. of America, New York
C12 Cumberland Steel Co., Cumberland, Md.
C13 Cuyahoga Steel & Wire Co., Cleveland
C14 Compressed Steel Shafting Co., Readville, Mass.
C15 G. O. Carlson, Inc., Thorndale, Pa.
C16 Connors Steel Div., Birmingham

D1 Detroit Steel Corp., Detroit
D2 Detroit Tube & Steel Div., Detroit
D3 Driver Harris Co., Harrison, N. J.
D4 Dickson Weatherproof Nail Co., Evanston, Ill.

E1 Eastern Stainless Steel Corp., Baltimore
E2 Empire Steel Co., Mansfield, O.

F1 Firth Sterling, Inc., McKeesport, Pa.
F2 Fitzsimmons Steel Corp., Youngstown
F3 Follansbee Steel Corp., Follansbee, W. Va.

G1 Globe Iron Co., Jackson, O.
G2 Granite City Steel Co., Granite City, Ill.
G3 Great Lakes Steel Corp., Detroit
G4 Greer Steel Co., Dover, O.

H1 Hanna Furnace Corp., Detroit

I2 Ingersoll Steel Div., Chicago
I3 Inland Steel Co., Chicago
I4 Interlake Iron Corp., Cleveland

J1 Jackson Iron & Steel Co., Jackson, O.
J2 Jessop Steel Corp., Washington, Pa.
J3 Jones & Laughlin Steel Corp., Pittsburgh
J4 Joslyn Mfg. & Supply Co., Chicago
J5 Judson Steel Corp., Emeryville, Calif.

K1 Kaiser Steel Corp., Fontana, Cal.
K2 Keystone Steel & Wire Co., Peoria
K3 Koppers Co., Granite City, Ill.

L1 Laclede Steel Co., St. Louis
L2 La Salle Steel Co., Chicago
L3 Lone Star Steel Co., Dallas
L4 Lukens Steel Co., Coatesville, Pa.

M1 Mahoning Valley Steel Co., Niles, O.
M2 McLouth Steel Corp., Detroit
M3 Mercer Tube & Mfg. Co., Sharon, Pa.
M4 Mid-States Steel & Wire Co., Crawfordsville, Ind.
M5 Monarch Steel Co., Inc., Hammond, Ind.
M6 Mystic Iron Works, Everett, Mass.

N1 National Supply Co., Pittsburgh
N2 National Tube Div., Pittsburgh
N3 Niles Rolling Mill Div., Niles, O.
N4 Northwestern Steel & Wire Co., Sterling, Ill.
N5 Newport Steel Corp., Newport, Ky.
N6 Northwest Steel Rolling Mills, Seattle
N7 Newman Crosby Steel Co., Pawtucket, R. I.

O1 Oliver Iron & Steel Co., Pittsburgh
O2 Oregon Steel Mills, Portland

P1 Page Steel & Wire Div., Monessen, Pa.
P2 Phoenix Iron & Steel Co., Phoenixville, Pa.
P3 Pilgrim Drawn Steel Div., Plymouth, Mich.
P4 Pittsburgh Coke & Chemical Co., Pittsburgh
P5 Pittsburgh Screw & Bolt Co., Pittsburgh
P6 Pittsburgh Steel Co., Pittsburgh
P7 Portsmouth Div., Detroit Steel Corp., Detroit
P8 Plymouth Steel Co., Detroit
P9 Pacific States Steel Co., Niles, Cal.
P10 Precision Drawn Steel Co., Camden, N. J.
P11 Production Steel Strip Corp., Detroit
P12 Pacific Steel Rolling Mills, Seattle

R1 Reeves Steel & Mfg. Co., Dover, O.
R2 Reliance Div., Eaton Mfg. Co., Massillon, O.
R3 Republic Steel Corp., Cleveland
R4 Roebling Sons Co., John A., Trenton, N. J.
R5 Rotary Electric Steel Co., Detroit
R6 Rodney Metals, Inc., New Bedford, Mass.
R7 Rome Strip Steel Co., Rome, N. Y.

S1 Sharon Steel Corp., Sharon, Pa.
S2 Sheffield Steel Corp., Kansas City
S3 Shenango Furnace Co., Pittsburgh
S4 Simonds Saw & Steel Co., Fitchburg, Mass.
S5 Sweet's Steel Co., Williamsport, Pa.
S6 Standard Forging Corp., Chicago
S7 Stanley Works, New Britain, Conn.
S8 Superior Drawn Steel Co., Monaca, Pa.
S9 Superior Steel Corp., Carnegie, Pa.

T1 Tonawanda Iron Div., N. Tonawanda, N. Y.
T2 Tennessee Coal & Iron Div., Fairfield
T3 Tennessee Products & Chem. Corp., Nashville
T4 Thomas Strip Div., Warren, O.
T5 Timken Steel & Tube Div., Canton, O.
T6 Tremont Nail Co., Wareham, Mass.
T7 Texas Steel Co., Fort Worth

U1 United States Steel Corp., Pittsburgh
U2 Universal-Cyclops Steel Corp., Bridgeville, Pa.
U3 Ulbrich Stainless Steels, Wallingford, Conn.
U4 U. S. Pipe & Foundry Co., Birmingham

W1 Wallingford Steel Co., Wallingford, Conn.
W2 Washington Steel Corp., Washington, Pa.
W3 Weirton Steel Co., Weirton, W. Va.
W4 Wheatland Tube Co., Wheatland, Pa.
W5 Wheeling Steel Corp., Wheeling, W. Va.
W6 Wickwire Spencer Steel Div., Buffalo
W7 Wilson Steel & Wire Co., Chicago
W8 Wisconsin Steel Co., S. Chicago, Ill.
W9 Woodward Iron Co., Woodward, Ala.
W10 Wyckoff Steel Co., Pittsburgh
W11 Worcester Pressed Steel Co., Worcester, Mass.

Y1 Youngstown Sheet & Tube Co., Youngstown

PIPE AND TUBING

Base discounts (pct) f.o.b. mills. Base price about $200 per net ton.

	BUTTWELD														SEAMLESS							
	½ In.		¾ In.		1 In.		1¼ In.		1½ In.		2 In.		2½–3 In.		2 In.		2½ In.		3 In.		3½–4 In.	
	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.	Blk.	Gal.
STANDARD T. & C.																						
Sparrows Pt. *B3*	21.75	6.5	24.75	10.5	27.25	14.0	29.75	14.75	30.25	15.75	30.75	16.25	32.25	16.0	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown *R3*	23.75	8.5	26.75	12.5	29.25	16.0	31.75	16.75	32.25	17.75	32.75	18.25	34.25	18.0	.....	.....	.....	.....	.....	.....	.....	.....
Fontana *K1*	10.75	+4.5	13.75	+0.5	16.25	3.0	18.75	3.75	19.25	4.75	19.75	5.25	21.25	5.0	.....	.....	.....	.....	.....	.....	.....	.....
Pittsburgh *J3*	23.75	8.5	26.75	12.5	29.25	16.0	31.75	16.75	32.25	17.75	32.75	18.25	34.25	18.0	13.5	+1.50	17.5	0.75	20.0	3.25	21.5	4.75
Alton, Ill. *L1*	21.75	6.5	24.75	10.5	27.25	14.0	29.75	14.75	30.25	15.75	30.75	16.25	32.25	16.0	.....	.....	.....	.....	.....	.....	.....	.....
Sharon *M3*	23.75	8.5	26.75	12.5	29.25	16.0	31.75	16.75	32.25	17.75	32.75	18.25	34.25	18.0	.....	.....	.....	.....	.....	.....	.....	.....
Fairless *N2*	21.75	6.5	24.75	10.5	27.25	14.0	29.75	14.75	30.25	15.75	30.75	16.25	32.25	16.0	.....	.....	.....	.....	.....	.....	.....	.....
Pittsburgh *N1*	23.75	8.5	26.75	12.5	29.25	16.0	31.75	16.75	32.25	17.75	32.75	18.25	34.25	18.0	13.5	+1.50	17.5	0.75	20.0	3.25	21.5	4.75
Wheeling *W5*	23.75	8.5	26.75	12.5	29.25	16.0	31.75	16.75	32.25	17.75	32.75	18.25	34.25	18.0	.....	.....	.....	.....	.....	.....	.....	.....
Wheatland *W4*	23.75	8.5	26.75	12.5	29.25	16.0	31.75	16.75	32.25	17.75	32.75	18.25	34.25	18.0	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown *Y1*	23.75	8.5	26.75	12.5	29.25	16.0	31.75	16.75	32.25	17.75	32.75	18.25	34.25	18.0	13.5	+1.50	17.5	0.75	20.0	3.25	21.5	4.75
Indiana Harbor *Y1*	22.75	7.5	25.75	11.5	28.25	15.0	30.75	15.75	31.25	16.75	31.75	17.25	33.25	17.0	.....	.....	.....	.....	.....	.....	.....	.....
Lorain *N2*	23.75	8.5	26.75	12.5	29.25	16.0	31.75	16.75	32.25	17.75	32.75	18.25	34.25	18.0	13.5	+1.50	17.5	0.75	20.0	3.25	21.5	4.75
EXTRA STRONG PLAIN ENDS																						
Sparrows Pt. *B3*	25.25	11.5	29.25	15.5	31.25	19.0	31.75	17.75	32.25	18.75	32.75	19.25	33.25	18.0	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown *R3*	27.25	13.5	31.25	17.5	33.25	21.0	33.75	19.75	34.25	20.75	34.75	21.25	35.25	20.0	.....	.....	.....	.....	.....	.....	.....	.....
Fairless *N2*	25.25	11.5	29.25	15.5	31.25	19.0	31.75	17.75	32.25	18.75	32.75	19.25	33.25	18.0	.....	.....	.....	.....	.....	.....	.....	.....
Fontana *K1*	14.25	.....	18.25	.....	20.25	.....	20.75	.....	21.25	.....	21.75	.....	22.25	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pittsburgh *J3*	27.25	13.5	31.25	17.5	33.25	21.0	33.75	19.75	34.25	20.75	34.75	21.25	35.25	20.0	14.0	.....	19.0	3.25	21.5	5.75	26.5	10.75
Alton, Ill. *L1*	25.25	11.5	29.25	15.5	31.25	19.0	31.75	17.75	32.25	18.25	32.75	19.25	33.25	18.0	.....	.....	.....	.....	.....	.....	.....	.....
Sharon *M3*	27.25	13.5	31.25	17.5	33.25	21.0	33.75	19.75	34.25	20.75	34.75	21.75	35.25	20.0	.....	.....	.....	.....	.....	.....	.....	.....
Pittsburgh *N1*	27.25	13.5	31.25	17.5	33.25	21.0	33.75	19.75	34.25	20.75	34.75	21.75	35.25	20.0	14.0	.....	19.0	3.25	21.5	5.75	26.5	10.75
Wheeling *W5*	27.25	13.5	31.25	17.5	33.25	21.0	33.75	19.75	34.25	20.75	34.75	21.75	35.25	20.0	.....	.....	.....	.....	.....	.....	.....	.....
Wheatland *W4*	27.25	13.5	31.25	17.5	33.25	21.0	33.75	19.75	34.25	20.75	34.75	21.75	35.25	20.0	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown *Y1*	27.25	13.5	31.25	17.5	33.25	21.0	33.75	19.75	34.25	20.75	34.75	21.75	35.25	20.0	14.0	.....	19.0	3.25	21.5	5.75	26.5	10.75
Indiana Harbor *Y1*	26.25	12.5	30.25	16.5	32.25	20.0	32.75	18.75	33.25	19.75	33.75	20.75	34.25	19.0	.....	.....	.....	.....	.....	.....	.....	.....
Lorain *N2*	27.25	13.5	31.25	17.5	33.25	21.0	33.75	19.75	34.25	20.75	34.75	21.75	35.25	20.0	14.0	.....	19.0	3.25	21.5	5.75	26.5	10.75

Threads only, buttweld and seamless 2¼ pt. higher discount. Plain ends, buttweld and seamless, 3-in. and under, 4½ pt. higher discount. Buttweld jobbers' discount, 5 pct.

Galvanized discounts based on zinc price in range of over 9¢ to 11¢ incl. per lb, East St. Louis. For each 2¢ change in zinc, discounts vary as follows: ½, ¾ and 1-in., 2 pt.; 1¼, 1½ and 2-in., 1½ pt.; 2½ and 3-in., 1 pt. e.g., zinc price in range of over 11¢ to 13¢ would lower discounts; zinc price in range of over 7¢ to 9¢ would increase discounts. East St. Louis zinc price now 11.50¢ per lb.

Steel Prices

(Effective Sept. 28, 1954)

To identify producers, see Key on preceding page.

RAILS, TRACK SUPPLIES

F.o.b. Mill Cents Per Lb	No. 1 Std. Rails	Light Rails	Joint Bars	Track Spikes	Screw Spikes	Tie Plates	Track Bolts Treated
Bessemer *U1*	4.45	5.35	5.425	....	....	....	....
So. Chicago *R3*	....	....	....	7.30	....	....	....
Ensley *T2*	4.45	5.35	....	....	....	....	....
Fairfield *T2*	....	5.35	....	7.30	....	5.275	....
Gary *U1*	4.45	5.35	....	....	....	5.275	....
Ind. Harbor *I3*	4.45	....	5.425	7.30	....	5.275	....
Johnstown *B3*	....	5.35	....	....	....	....	....
Joliet *U1*	....	5.35	5.425	....	....	....	....
Kansas City *S2*	....	....	....	7.30	....	....	11.50
Lackawanna *B3*	4.45	5.35	5.425	....	....	5.275	....
Minnequa *C6*	4.45	5.85	5.425	7.30	....	5.275	11.50
Pittsburgh *O1*	....	....	....	....	11.00	....	11.50
Pittsburgh *P5*	....	....	....	....	11.00	....	11.50
Pittsburgh *J3*	....	....	....	7.30	....	....	....
Seattle *B2*	....	....	....	7.80	....	5.425	11.50
Steelton *B3*	4.45	....	5.425	....	....	5.275	....
Struthers *Y1*	....	....	....	7.30	....	....	....
Torrance *C7*	....	....	....	....	....	5.425	....
Williamsport *S5*	....	5.35	....	....	....	....	....
Youngstown *R3*	....	....	....	7.30	....	....	....

ELECTRICAL SHEETS

22-Gage F.o.b. Mill Cents Per Lb	Hot-Rolled (Cut Lengths)*	Cold-Reduced (Coiled or Cut Length) Semi-Processed	Fully Processed
Field	8.025	8.225	....
Armature	8.50	8.75	9.25
Elect.	9.10	9.35	9.85
Motor	10.10	10.35	10.85
Dynamo	11.00	11.25	11.75
Trans. 72	11.95	12.20	12.70
Trans. 65	12.50	Grain Oriented	
Trans. 58	13.00	Trans. 80	16.60
Trans. 52	14.00	Trans. 73	17.10

Producing points: Beech Bottom (*W5*); Brackenridge (*A5*); Granite City (*G2*); Indiana Harbor (*I3*); Mansfield (*E2*); Newport, Ky. (*N5*); Niles, O. (*N3*); Vandergrift (*U1*); Warren, O. (*R3*); Zanesville (*A7*).

* Coils 75¢ higher.

CLAD STEEL

	Plate	Sheet
Stainless-carbon		
No. 304, 20 pct.		
Coatesville, Pa., *L4*	*33.20	
Washington, Pa., *J2*	....	
Claymont, Del., *C4*	....	
New Castle, Ind., *I2*	....	32.50
Nickel-carbon		
10 pct. Coatesville, Pa., *L4*	38.30	
Inconel-carbon		
10 pct., Coatesville, Pa., *L4*	46.90	
Monel-carbon		
10 pct. Coatesville, Pa., *L4*	39.70	

* Includes annealing and pickling, sandblasting.

MERCHANT WIRE PRODUCTS

F.o.b. Mill	Standard & Coated Nails	Woven Wire Fence 9-15½ ga.	"T" Fence Posts	Single Loop Bale Ties	Galv. Barbed and Twisted Barbless Wire	Merch. Wire Ann'ld ¢/lb.	Merch. Wire* Galv. ¢/lb.
	Col	Col	Col	Col	Col		
Alabama City *R3*	137	146	...	155	159	6.90	7.30
Aliquippa, Pa. *J3*	137	149	...	....	156	6.90	7.425
Atlanta *A8*	139	151	...	157	164	7.00	7.525
Bartonsville *K2*	139	151	...	157	164	7.00	7.55
Buffalo *W6*	....	....	....	....	....	6.90	7.30
Chicago, Ill. *N4*	137	149	...	155	162	6.90	7.45
Cleveland *A6*	142	....	....	....	....	....	....
Cleveland *A5*	....	....	....	....	....	6.90	....
Crawfordsville *M4*	139	151	...	157	159	7.00	7.55
Donora, Pa. *A5*	137	146	...	155	159	6.90	7.30
Duluth *A5*	137	146	150	155	159	6.90	7.30
Fairfield, Ala. *T2*	137	146	...	155	159	6.90	7.30
Galveston *D4*	139	....	....	....	....	....	....
Houston *S2*	145	154	....	....	167	7.30	7.70
Johnstown, Pa. *B3*	137	149	....	....	162	6.90	7.45
Joliet, Ill. *A5*	137	146	....	155	159	6.90	7.30
Kokomo, Ind. *C9*	139	148	....	157	161	7.00	7.55
Los Angeles *B2*	....	....	....	....	....	7.85	....
Kansas City *S2*	148	158	....	167	171	7.50	7.90
Minnequa *C6*	142	156	150	160	168	7.15	7.55
Monessen *P6*	137	151	....	....	163	6.90	7.45
Moline, Ill. *R3*	....	....	145	....	....	....	....
Pittsburg, Cal. *C7*	156	169	...	179	179	7.85	8.25
Portsmouth *P7*	....	....	....	....	....	6.90	7.90
Rankin, Pa. *A5*	137	146	....	....	159	6.90	7.30
So. Chicago *R3*	137	146	145	155	159	6.90	7.30
S. San Francisco *C6*	....	....	....	....	179	....	....
Sparrows Pt. *B3*	139	....	....	157	164	7.00	7.55
Struthers, O. *Y1*	....	....	....	....	....	6.90	7.55
Worcester *A5*	143	....	....	....	....	7.20	....
Williamsport, Pa. *S5*	....	....	150	....	....	....	....

Cut Nails, carloads, base $8.30 per keg at Conshohocken, Pa. (*A2*).

* Alabama City and So. Chicago don't include zinc extra Galvanized products computed with zinc at 11.0¢ per lb

C-R SPRING STEEL

Cents Per Lb F.o.b. Mill	CARBON CONTENT 0.26-0.40	0.41-0.60	0.61-0.80	0.81-1.05	1.06-1.35
Bridgeport, New Britain, Conn. *S7**	5.75	8.05	9.00	11.15	13.85
Buffalo, N. Y. *R7*	5.75	8.05	9.00	10.95	13.25
Carnegie, Pa. *S9*	....	8.05	9.00	11.15	13.85
Cleveland *A5*	5.75	8.05	9.00	11.15	13.85
Detroit *D1*	5.90	8.25	9.20	10.95	....
Detroit *D2*	5.90	8.25	9.20	....	....
Harrison, N. J. *C11*	....	....	9.30	11.45	14.15
Indianapolis *C5*	6.00	8.20	9.00	11.15	13.85
New Castle, Pa. *B4*	5.75	8.05	9.00	10.95	....
New Haven, Conn. *D1*	6.20	8.35	9.30	11.25	....
Pawtucket, R. I. *N7*	6.30	8.35	9.30	11.45	14.15
Riverdale, Ill. *A1*	5.85	8.05	9.00	11.15	13.85
Sharon, Pa. *S1*	5.75	8.05	9.00	11.15	13.85
Trenton *R4*	....	8.35	9.30	11.25	13.40
Wallingford *W1*	6.20	8.35	9.30	11.45	14.15
Warren, Ohio *T4*	5.75	8.05	9.00	10.95	13.25
Weirton, W. Va. *W3*	5.85	8.05	9.00	10.95	13.25
Worcester, Mass. *A5*	6.60	8.35	9.30	11.45	14.15
Youngstown *C5*	5.85	8.05	9.00	11.15	13.85

* Sold on Pittsburgh base.

BOILER TUBES

$ per 100 ft. carload lots, cut 10 to 24 ft. F.o.b. Mill	Size OD-In.	Size B.W. Ga.	Seamless H.R.	Seamless C.D.	Elec. Weld H.R.	Elec. Weld C.D.
Babcock & Wilcox	2	13	28.33	33.97	27.48	32.95
	2½	12	38.15	45.74	37.00	44.34
	3	12	44.05	52.82	42.72	51.23
	3½	11	51.43	61.66	49.88	59.81
	4	10	68.29	81.88	66.24	79.42
National Tube	2	13	28.33	33.97	27.48	....
	2½	12	38.15	45.74	37.00	....
	3	12	44.05	52.82	42.72	....
	3½	11	51.43	61.66	49.88	....
	4	10	68.29	81.88	66.24	....
Pittsburgh Steel	2	13	28.33	33.97	....	....
	2½	12	38.15	45.74	....	....
	3	12	44.05	52.82	....	....
	3½	11	51.43	61.66	....	....
	4	10	68.29	81.88	....	....

WAREHOUSES

Base price, f.o.b., dollars per 100 lb.

Cities	City Delivery Charge	Sheets: Hot-Rolled	Sheets: Cold-Rolled (15 gage)	Sheets: Galvanized (10 gage)	Strip: Hot-Rolled	Strip: Cold-Rolled	Plates	Shapes: Standard Structural	Bars: Hot-Rolled	Bars: Cold-Finished	Alloy Bars: Hot-Rolled A 4615 As Rolled	Alloy Bars: Hot-Rolled A 4140 Annealed	Alloy Bars: Cold-Drawn A 4615 As Rolled	Alloy Bars: Cold-Drawn A 4140 Annealed
Baltimore	$.20	6.22	7.51	7.78	6.89	....	6.57	6.92	6.88	8.52	....	....	....	....
Birmingham	.15	6.35-6.50	7.35-8.10	8.25-9.00	6.60	9.60	6.65	6.65	6.50	9.00	....	....	....	....
Boston	.10	7.23	8.23	9.42-9.52	7.47	9.65-9.85	7.34-7.37	7.49	7.20	8.60-8.70	12.60-12.80	12.45-12.46	15.15	15.10
Buffalo	.20	6.35-6.40	7.40[3]-7.45	8.80-8.84	6.70-6.75	....	6.65-6.70	6.70-6.77	6.50-6.55	7.85[3]-7.90	12.50	12.15[3]	14.85	14.75-14.80[3]
Chicago	.20	6.38	7.38	8.30	6.62	....	6.52	6.69	6.51	7.50	12.25	11.90	14.60	14.55
Cincinnati	.15	6.49-6.53	7.37-7.42	8.25-8.30	6.80-6.91	....	6.81-6.86	6.91	6.75-6.80	7.80-7.85	12.55	12.15-12.20	14.90	14.80-14.85
Cleveland	.20	6.38	7.38	8.45	6.72	....	6.69	7.02	6.57	7.60	11.96	....	....	14.61
Denver	....	7.85	8.85	10.02	8.20	....	7.95	7.95	8.05	9.05	....	....	....	....
Detroit	.20	6.57	7.57	8.50-8.58	6.90	....	6.80-6.85	7.16	6.79	7.77	12.45	12.10	14.80	14.75
Houston	.20	7.35	7.65-7.80	9.93	7.70	....	7.35	7.60	7.70	9.50-9.60	....	13.10	....	....
Kansas City	.20	7.05	8.05	8.95	7.29	....	7.19	7.36	7.18	8.07-8.27	....	12.27	....	....
Los Angeles	.20	7.40	9.25	9.85	7.75	....	7.35	7.55	7.35-7.45	10.05	....	13.20	....	16.35
Memphis	.19	6.79	7.69	....	6.90	....	7.01	7.09	6.88	8.24	....	....	....	....
Milwaukee	.20	6.47	7.47	8.21-8.39	6.71	....	6.61	6.86	6.60	7.69	12.34	11.99	14.69	14.64-14.84
New Orleans	.15	6.70	7.65	9.23	6.80	....	6.90-6.95	7.05	6.80	8.70-10.70	....	....	....	....
New York	.10	6.97-6.98	7.78-8.46	8.79[1]-8.99	7.36-7.56	....	7.18-7.27	7.13-7.38	7.30-7.37	8.63-8.73[2]	12.63	12.28	....	14.93
Norfolk	.20	7.00	....	....	7.10	....	7.10	7.10	7.10	8.60	....	....	....	....
Philadelphia	.10	6.19	7.29[3]	8.09[4]-8.23	6.96	....	6.49	6.54	6.74	8.19[3]	....	11.66-11.96[3]	....	14.61[3]
Pittsburgh	.20	6.38	7.38	8.30-8.50	6.72-6.75	....	6.52	6.69	6.51	7.85	12.25	11.90	14.60	14.55
Portland	.20	7.60	8.75	9.05	7.85	....	7.45	7.50	7.55	10.95	....	....	....	....
Salt Lake City	.20	7.65	10.20	10.70	9.05	....	7.70	7.70-8.85	8.80	10.95	....	....	....	....
San Francisco	.20	7.55	8.95	9.35-9.85	7.80	....	7.40	7.50	7.35	10.05	....	13.20	....	16.35
Seattle	.00	8.10	9.80	10.15	8.20	....	7.80	7.75	7.80	10.95	....	13.65	....	16.30
St. Louis	.20	6.62-6.67	7.67	8.54-8.59	6.91	....	6.81	7.09	6.80	7.89	12.54	12.19	14.84-14.89	14.45-14.84
St. Paul	.15	7.03	8.03-8.58	8.96	7.28	....	7.19	7.35	7.16	8.26	....	12.56	....	15.21

Base Quantities (Standard unless otherwise keyed): Cold finished bars: 2000 lb or over. Alloy bars: 1000 to 1999 lb. All others: 2000 to 9999 lb. All HR products may be combined for quantity. All galvanized sheets may be combined for quantity. CR sheets may not be combined with each other or with galvanized sheets for quantity.

Exceptions: (1) 1500 to 9999 lb. (2) 1000 lb or over. (3) $.25 delivery. (4) 1000 to 1999 lb, $.25 delivery.

Miscellaneous Prices

(Effective Sept. 28, 1954)

TOOL STEEL

F.o.b. Mill

W	Cr	V	Mo	Co	Base per lb
18	4	1	—	5	$2.345
18	4	1	—	—	1.705
18	4	2	—	—	.90
1.5	4	1.5	8	—	1.29
6	4	2	6	—	1.29

High-carbon chromium ..... .73
Oil hardened manganese ..... .405
Special carbon ..... .37
Extra carbon ..... .31
Regular carbon ..... .26

Warehouse prices on and east of Mississippi are 3.5¢ per lb higher. West of Mississippi, 5.5¢ higher.

CAST IRON WATER PIPE

	Per Net Ton
6 to 24-in., del'd Chicago	$111.80 to $115.30
6 to 24-in., del'd N. Y...	115.00 to 116.00
6 to 24-in., Birmingham	98.00 to 102.50
6-in. and larger f.o.b. cars, San Francisco, Los Angeles, for all rail shipments; rail and water shipments less	$129.50 to $131.50

Class "A" and gas pipe, $5 extra; 4-in. pipe in $5 a ton above 6-in.

LAKE SUPERIOR ORES

51.50% Fe; natural content, delivered lower Lake ports. Prices effective July 1, 1953, to end of 1954 season.

	Gross Ton
Openhearth lump	$11.15
Old range, bessemer	10.30
Old range, nonbessemer	10.15
Mesabi, bessemer	10.05
Mesabi, nonbessemer	9.90
High phosphorus	9.90

Prices based on upper Lakes rail freight rates, Lake vessel freight rates, handling and unloading charges, and taxes thereon, in effect on June 24, 1953. Increases or decreases after such date are for buyer's account.

COKE

	Net-Ton
Furnace, beehive (f.o.b. oven) Connellsville, Pa.	$14.25 to $14.50
Foundry, beehive (f.o.b. oven) Connellsville, Pa.	$16.50 to $17.00
Foundry, oven coke	
Buffalo, del'd	$28.08
Chicago, f.o.b.	24.50
Detroit, f.o.b.	25.50
New England, del'd	26.05
Seaboard, N. J., f.o.b.	24.00
Philadelphia, f.o.b.	23.00
Swedeland, Pa., f.o.b.	23.00
Painesville, Ohio, f.o.b.	25.50
Erie, Pa., f.o.b.	25.00
Cleveland, del'd	27.48
Cincinnati, del'd	26.56
St. Paul, f.o.b.	23.75
St. Louis, f.o.b.	26.00
Birmingham, f.o.b.	22.65
Lone Star, Tex., f.o.b.	18.50

ELECTRODES

Cents per lb, f.o.b. plant, threaded, with nipples, unboxed

GRAPHITE			CARBON		
Diam. (In.)	Length (In.)	Price	Diam. (In.)	Length (In.)	Price
24	84	20.50	40	100, 110	8.95
20	72	20.00	35	110	8.95
12 to 18	72	20.50	30	110	8.95
7 to 10	60	21.00	24	72 to 84	9.10
6	60	23.25	20	90	8.95
4	40	26.00	17	72	9.10
3	40	27.25	14	72	9.50
2½	30	28.00	10, 12	60	10.30
2	24	43.50	8	60	10.55

BOLTS, NUTS, RIVETS, SCREWS

(Base discount, f.o.b. mill)

Machine and Carriage Bolts

	Discount Less Case	C.
½ in. & smaller x 4 in. & shorter	2	22
½ in. & smaller x 6 in. & shorter	+3	18
9/16 in. & ⅝ in. x 6 in. & shorter	+4	17
¾ in. & larger x 6 in. & shorter	+6	15
All diam. longer than 6 in..	+15	8
½ in. & smaller x 6 in. & shorter	+3	18
Lag, all diam. x 6 in. & shorter	6	25
Lag, all diam. longer than 6 in.	+2	19
Plow bolts	33	23

Stove Bolts

Packaged, package list... 41-44½—10
Bulk, bulk list* ..... 56-59 —..

*Minimum quantity per item: 15,000 pieces lengths to 3"; 5,000 pieces lengths over 3". Special finishes: Zinc, Parkerized, cadmium or nickel add 8¢ per lb net. Black oil finish add 2½¢ per lb net.

Nuts, H.P., C.P., reg. & hvy.

	Base Discount	Discount, Case or Keg
¾" or smaller	55	64
⅞" to 1¼" inclusive ...	58	66
1⅜" to 1½" inclusive ..	60	67½

C.P. Hex regular & hvy.

All sizes	55	64

Hot Galv. Nuts (all types)

¾" or smaller	38	50
⅞" to 1½" inclusive ...	41	52½

Finished, Semi-finished, Slotted or Castellated Nuts

All sizes	55	66

Rivets

	Base per 100 lb
½ in. & larger	$9.25
	Pct Off List
7/16 in. and smaller	37

Cap Screws

	Discount Bright	H.C. Heat Treated
New std. hex head, packaged		
⅝" x 6" and smaller and shorter	38	28
¾", ⅞", 1" x 6" and shorter	15	1
New std. hex head, bulk*		
⅝" x 6" and smaller and shorter	50	42
¾", ⅞", 1" x 6" and shorter	32	21

*Minimum quantity per item: 15,000 pieces ¼", 5/16", ⅜" diam. 5,000 pieces 7/16", ½", 9/16", ⅝" diam. 2,000 pieces ¾", ⅞", 1" diam.

Machine Screws

	Discount
Packaged, gross list.. 31-36	—10
Bulk, bulk list* 11-17	—..

*Minimum bulk quantity, 15,000 pieces per item.

Machine Screw & Stove Bolt Nuts

Packaged, package list 31-36	—10
Bulk, bulk list* 11-17	—..

*Minimum bulk quantity, 15,000 pieces per item.

REFRACTORIES

Fire Clay Brick

Carloads per 1000

First quality, Ill., Ky., Md., Mo., Ohio, Pa. (except Salina, Pa., add $5.00)..	$114.00
No. 1 Ohio	107.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	107.00
No. 2 Ohio	98.00
Ground fire clay, net ton, bulk (except Salina, Pa., add $1.50)	17.00

Silica Brick

Mt. Union, Pa., Ensley, Ala.	$120.00
Childs, Hays, Pa.	125.00
Chicago District	130.00
Western Utah	.....
California	.....
Super Duty Hays, Pa., Athens, Tex., Windham	137.00
Curtner, Calif.	155.00
Silica cement, net ton, bulk, Eastern (except Hays, Pa.)	20.00
Silica cement, net ton, bulk, Hays, Pa.	22.00
Silica cement, net ton, bulk, Chicago District, Ensley, Ala.	21.00
Silica cement, net ton, bulk, Utah and Calif.	.....

Chrome Brick

Per net ton

Standard chemically bonded Balt..	$86.00
Standard chemically bonded, Curtner, Calif.	96.25
Burned, Balt.	80.00

Magnesite Brick

Standard Baltimore	$109.00
Chemically bonded, Baltimore	97.50

Grain Magnesite

St. ⅜-in. grains

Domestic, f.o.b. Baltimore in bulk fines removed	$64.40
Domestic, f.o.b. Chewalah, Wash., Luning, Nev. in bulk	38.00
in sacks	43.75

Dead Burned Dolomite

Per net ton

F.o.b. bulk, producing points in: Pa., W. Va., Ohio	$14.50
Midwest	14.60
Missouri Valley	13.65

FLUORSPAR

Washed gravel, f.o.b. Rosiclaire, Ill.
Price, net ton; effective CaF_2 content

72½%	$44.00
70% or more	42.50
60% or less	38.00

METAL POWDERS

Per pound, f.o.b. shipping point, in ton lots, for minus 100 mesh.

Swedish sponge iron c.i.f. New York, ocean bags ...	11.25¢
Canadian sponge iron, Del'd in East	12.0¢
F.o.b. ship. pt., carloads...	9.5¢
Domestic sponge iron, 98+% Fe, carload lots	18.0¢
Electrolytic iron, annealed, 99.5+% Fe	38.0¢
Electrolytic iron, unannealed, minus 325 mesh, 99+% Fe	53.5¢
Hydrogen reduced iron minus 300 mesh, 98+% Fe..	63.0¢ to 80.0¢
Carbonyl iron, size 5 to 10 mieron, 98%, 00.8+% Fe..	83.0¢ to $1.48
Aluminum	31.5¢
Brass, 10 ton lots	29.50¢ to 36.50¢
Copper, electrolytic	43.50¢
Copper, reduced	43.50¢
Cadmium, 100-199 lb. 95¢ plus metal value	
Chromium, electrolytic, 99% min., and quality, del'd...	$3.60
Lead	21.00¢
Manganese	57.0¢
Molybdenum, 99%	$2.75
Nickel, unannealed	89.50¢
Nickel, annealed	96.50¢
Nickel, spherical, unannealed	93.50¢
Silicon	43.50¢
Solder powder..7.0¢ to 9.0¢ plus met. value	
Stainless steel, 302	91.0¢
Stainless steel, 316	$1.10
Tin .....14.04¢ plus metal value	
Tungsten, 99% (65 mesh) ..	$4.05
Zinc, 10 ton lots .....17.5¢ to 25.0¢	

Ferroalloy Prices

(Effective Sept. 28, 1954)

Ferrochrome

Contract prices, cents per lb contained Cr, lump, bulk, carloads, del'd, 65-72% Cr, 2% max Si.

0.025% C ..	36.00	0.15% C ...	33.75
0.025% C, Simplex ..	34.50	0.20% C ...	33.50
		0.50% C ...	33.25
0.06% C ...	34.50	1.00% C ...	33.00
0.10% C ...	34.00	2.00% C ...	32.75

65-69% Cr, 4-9% C 24.75
62-66% Cr, 4-6% C, 6-9% Si 25.60

S. M. Ferrochrome

Contract prices, cents per pound, chromium contained, lump size, delivered.
High carbon type: 60.65% Cr, 4-6% Si, 4-6% Mn, 4-6% C.

Carloads	25.85
Ton lots	28.00
Less ton lots	29.50

High-Nitrogen Ferrochrome

Low-carbon type 67-72% Cr, 0.75% N. Add 5¢ per lb to regular low carbon ferrochrome price schedule. Add 3¢ for each additional 0.25% of N.

Chromium Metal

Contract prices, per lb chromium contained, packed, delivered, ton lots, 97% min. Cr, 1% max. Fe.

0.10 max. C	$1.18
0.50% max. C	1.16
9 to 11% C	1.25

Low Carbon Ferrochrome Silicon

(Cr 34-41%, Si 42-49%, C 0.05% max.) Contract price, carloads, f.o.b. Niagara Falls, freight allowed, lump 4-in. x down, 24.75¢ per lb contained Cr plus 12.00¢ per lb contained Si. Bulk 2-in. x down, 25.05¢ per lb contained Cr plus 10.80¢ per lb contained Si. Bulk 1-in. x down, 25.25¢ per lb contained Cr plus 11.00¢ per lb contained Si.

Calcium-Silicon

Contract price per lb of alloy, lump, delivered.
30-33% Cr, 60-65% Si, 3.00 max. Fe.

Carloads	19.00
Ton lots	22.10
Less ton lots	23.60

Calcium-Manganese—Silicon

Contract prices, cents per lb of alloy, lump, delivered.
16-20% Ca, 14-18% Mn, 53-59% Si.

Carloads	20.00
Ton lots	22.30
Less ton lots	23.30

SMZ

Contract prices, cents per pound of alloy, delivered, 60-65% Si, 5-7% Mn, 5-7% Zr, 20% Fe ½ in. x 12 mesh.

Ton lots	17.50
Less ton lots	19.50

V Foundry Alloy

Cents per pound of alloy, f.o.b. Suspension Bridge, N. Y., freight allowed, max. St. Louis, V-5; 38-42% Cr, 17-19% Si, 8-11% Mn, packed.

Carload lots	16.60
Ton lots	18.10
Less ton lots	19.35

Graphidox No. 4

Cents per pound of alloy, f.o.b. Suspension Bridge, N. Y., freight allowed, max. St. Louis. Si 48 to 52%: Ti 9 to 11%, Ca 5 to 7%.

Carload packed	17.50
Ton lots to carload packed	18.50
Less ton lots	20.00

Ferromanganese

Maximum contract base price, f.o.b., lump size, base content 74 to 76 pct Mn;

Producing Point	Cents per-lb
Marrietta, Ashtabula, O.; Alloy, W. Va.; Sheffield, Ala.; Portland, Ore.	9.50
Clairton, Pa.	9.50
Sheridan, Pa.	9.50
Philo, Ohio	9.50

Add or subtract 0.1¢ for each 1 pct Mn above or below base content.
Briquets, delivered, 66 pct Mn:

Carloads, bulk	12.05
Ton lots packed	13.65

Spiegeleisen

Contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

Manganese	Silicon	
16 to 19%	3% max.	$84.00
19 to 21%	3% max.	86.00
21 to 23%	3% max.	88.50
23 to 25%	3% max.	91.00

Manganese Metal

Contract basis, 2 in. x down, cents per pound of metal, delivered.
95.50% min. Mn, 0.2% max. C, 1% max. Si, 2.5% max. Fe.

Carload, packed	45.00
Ton lots	43.50

Electrolytic Manganese

F.o.b. Knoxville, Tenn., freight allowed east of Mississippi, cents per pound.

Carloads	30.00
Ton lots	32.00
250 to 1999 lb	34.00
Premium for hydrogen-removed metal	0.75

Medium Carbon Ferromanganese

Mn 80% to 85%, C 1.25 to 1.50. Contract price, carloads, lump, bulk, delivered, per lb of contained Mn ..... 21.35¢

Low-Carb Ferromanganese

Contract price, cents per pound Mn contained, lump size, del'd Mn 85-90%.

	Carloads	Ton	Less
0.07% max. C, 0.06% P, 90% Mn	32.00	33.85	35.05
0.07% max. C	29.95	31.80	33.80
0.15% max. C	28.45	30.30	31.50
0.30% max. C	26.95	28.80	30.00
0.50% max. C	26.45	28.30	29.50
0.75% max. C, 80-85% Mn, 5.0-7.0% Si	23.45	25.30	26.50

Silicomanganese

Contract basis, lump size, cents per pound of metal, delivered, 65-68% Mn, 18-20% Si, 1.5% max. C for 2% max. C, deduct 0.2¢.

Carload bulk	11.00
Ton lots	12.65
Briquet contract basis carlots, bulk, delivered, per lb of briquet	12.65
Ton lots, packed	14.25

Silvery Iron (electric furnace)

Si 14.01 to 14.50 pct, f.o.b. Keokuk, Iowa, or Wenatchee, Wash., $92.00 gross ton, freight allowed to normal trade area. Si 15.01 to 15.50 pct, f.o.b. Niagara Falls, N. Y., $89.50. Add $1.00 per ton for each additional 0.50% Si up to and including 17%. Add $1.45 for each 0.50% Mn over 1%.

Silicon Metal

Contract price, cents per pound contained Si, lump size, delivered, packed.

	Ton lots	Carloads
96% Si, 2% Fe	20.10	18.00
97% Si, 1% Fe	20.60	18.50

Silicon Briquets

Contract price, cents per pound of briquets, bulk, delivered, 40% Si, 2 lb Si briquets.

Carloads, bulk	6.75
Ton lots	8.35

Electric Ferrosilicon

Contract price, cents per lb contained Si, lump, bulk, carloads, delivered.

25% Si	20.00	75% Si	14.40
50% Si	12.00	85% Si	16.10
65% Si	13.50	90% Si	17.25

Calcium Metal

Eastern zone contract prices, cents per pound of metal, delivered.

	Cast	Turnings	Distilled
Ton lots	$2.05	$2.95	$3.75
Less ton lots	2.40	3.30	4.55

Ferrovanadium

35-55% contract, basis, delivered, per pound, contained V.

Openhearth	$3.00-$3.10
Crucible	3.10- 3.20
High speed steel (Primos)	3.20- 3.25

Alsifer, 20% Al, 40% Si, 40% Fe,

Contract basis, f.o.b. Suspension Bridge, N. Y., per lb.

Carloads	9.25¢
Ton lots	10.15

Calcium molybdate, 48.3-46.6%,

f.o.b. Langeloth, Pa., per pound contained Mo $1.15

Ferrocolumbium, 50-60%, 2 in. x D contract basis, delivered per pound contained Cb.

Ton lots	$12.00
Less ton lots	12.05

Ferro-tantalum-columbium, 20%

Ta, 40% Cb, 0.30% C, contract basis, del'd, ton lots, 2-in. x D per lb cont'd Cb plus Ta..... $6.25

Ferromolybdenum, 55-75%, f.o.b.

Langleoth, Pa., per pound contained Mo. $1.32

Ferrophosphorus, electric, 23-26%, car lots, f.o.b. Siglo, Mt. Pleasant, Tenn., $4.00 unitage, per gross ton

	$90.00
10 tons to less carload	$110.00

Ferrotitanium, 40% regular grade,

0.10% C max., f.o.b. Niagara Falls, N. Y., and Bridgeville, Pa., freight allowed, ton lots, per lb contained Ti..... $1.35

Ferrotitanium, 25% low carbon,

0.10% C max., f.o.b. Niagara Falls, N. Y., and Bridgeville, Pa., freight allowed, ton lots, per lb contained Ti $1.50
Less ton lots 1.55

Ferrotitanium, 15 to 18% high carbon, f.o.b. Niagara Falls, N. Y., freight allowed, carload, per net ton

	$177.00

Ferrotungsten, ¼ x down,

packed, per pound contained W. ton lots, f.o.b. $3.30

Molybdic oxide, briquets or cans,

per lb contained Mo, f.o.b. Langeloth, Pa. $1.14
bags, f.o.b. Washington, Pa., Langeloth, Pa. $1.13

Simanal, 20% Si, 20%Mn, 20% Al, contract basis, f.o.b. Philo, Ohio, freight allowed, per lb.

Carload, bulk, lump	15.50¢
Ton lots, packed lump	16.75¢
Less ton lots, lump, packed	17.25¢

Vanadium Pentoxide, 86-89% V_2O_5 contract basis, per pound contained V_2O_5 ..... $1.28

Zirconium, contract basis, per lb of alloy

35-40%, f.o.b., freight allowed, ton lots	26.00¢
12-15%, del'd, lump, bulk-carloads	8.00¢

Boron Agents

Borosil, contract prices per lb of alloy del. f.o.b. Philo, Ohio, freight allowed. B, 3.14%, Si, 40-45%, per lb contained B.... $5.35

Bortam, f.o.b. Niagara Falls

Ton lots, per pound	45¢
Less ton lots, per pound	50¢

Corbortam, Ti 15-21%, B 1-2% Si 2-4%, Al 1-2%, C 4.5-7.5%, f.o.b. Suspension Bridge, N. Y., freight allowed.

Ton lots per pound	10.00¢

Ferroboron, 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C, 1 in., x D, Ton lots... F.o.b. Wash., Pa.; 100 lb up

	$1.20
10 to 14% B	.35
14 to 19% B	1.30
19% min. B	1.50

Grainal, f.o.b. Bridgeville, Pa., freight allowed, 100 lb and over

No. 1	$1.00
No. 6	63¢
No. 79	59¢

Manganese-Boron, 75.00% Mn, 15-20% B, 5% max. Fe, 1.50% max. Si, 3.00% max. C, 2 in. x D, del'd.

Ton lots	$1.46
Less ton lots	1.57

Nickel-Boron, 15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, balance Ni, del'd, less ton lots $2.05

Silcaz, Contract basis, delivered

Ton lots	45.00¢

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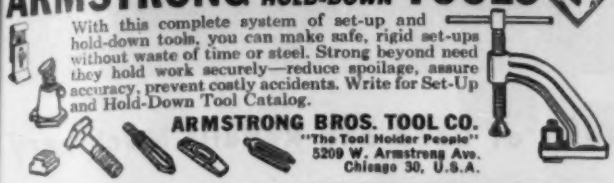

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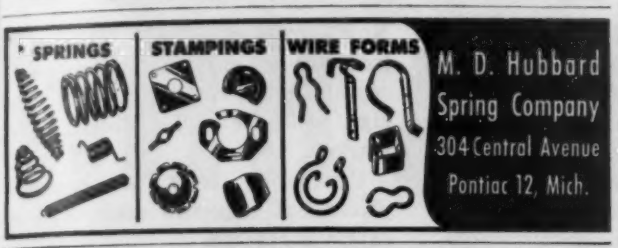

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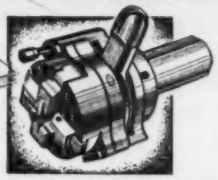

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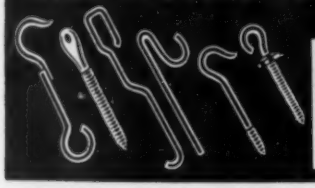

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16" x 54" cc SIDNEY Tri-Trol, taper, chucks, coolant, new 1942
20" x 15' cc BERTRAM (Niles), 2 carriages, taper, chucks, new 1943

Mills

No. 4MI CINCINNATI Plain Horizontal, new 1946
No. 2MI CINCINNATI Vertical, new 1951
No. 3 CINCINNATI High Speed Dial Type Vertical, new 1951

Turret Lathes

No. 4 WARNER & SWASEY, preselector head, bar feed, new 1942
No. 4L GISHOLT, 12½" spindle, cross sliding turret, new 1948

Shapers

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36" ROCKFORD Hydraulic Openside Shaper, new 1948

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4'-11" FOSDICK Sensitive, new 1951
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Boring Mills

3" bar YODER, table 24" x 48", new 1942
4" bar GIDDINGS & LEWIS, 36" x 96" table, new 1943
6" bar, No. 360F GIDDINGS & LEWIS Floor Type, floor plate, new 1944

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16/20" x 36" NORTON Type "C", raised in sand, new 1944
16/20" x 72" NORTON Type "C", raised in sand, new 1943
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No. 6G SELLERS Drill Grinder, new 1944

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60" x 120" centers NILES Heavy Duty Lathe, forced feed lubrication, power rapid traverse, 25HP and 2HP motor
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News of Used and Rebuilt Machinery

No Upward Pattern . . . Southern California's used machinery business not appreciably altered in the last month—just going along, with no definite up or down pattern. There is a mixture of hesitancy and hopefulness occasioned by recent Pacific events.

There is the promise of numerous new military programs, which creates spurts of fast and furious figuring on production requirements. When the figuring is done, there is still a great big "maybe" as to whether the work will come through.

Tool room equipment hasn't yet loosened up sufficiently to create a moving market.

Building, Electronics Help . . . Sheet metal equipment is still buttressed by a lively building trade and the large electronics industry concentrated in the area. Some unusually large metalworking planers for this area are now being offered. Planers are still sought in 10-20 ft table lengths priced low enough for ready conversion into spar milling machines.

No change in the press market. It's still holding up at slightly lower prices.

Inquiries for automatic screw machines are few, with some movement in older, very competitively priced automatics purchased on the basis of stopgap investment.

Good demand and steady prices prevail for welding equipment.

There are not too many American made radials of a late type available here. But an increase in supply would not bring further activity unless there was more attraction pricewise. Foreign make used radials are ample but the price simply isn't appealing.

Sell Few Foreign Tools . . . Used machinery dealers in Los Angeles say foreign tools received a greater degree of acceptability here than any other part of the country because of the unavailability of used machinery during the Korean War. Now, however, foreign make used tools are not enjoying the same acceptability. Some high quality foreign tools are still finding a good market.

Production tools are contemplated but inquiries made with a cautious reserve.

In the Pacific Northwest, you had a good or bad summer depending on the type of used machinery handled. Dealers selling machinery for the lumber industry or its affiliates found things tough. But construction machinery moved along at a good clip, and prospects are good for these dealers for the months to come.

Seek Late Models . . . One of the biggest troubles in the region is getting "modern" used machinery, according to leading dealers checked by THE IRON AGE. The demand is for late-model machinery, good enough to put the buyer in a competitive position. The high price of today's manpower makes efficient machinery a must, and dealers have to travel far to get suitable material.

Prices are holding up well, with a plentiful supply, in the San Francisco region, although there is some feeling of a slight downtrend. Lathes are weak, but standard tools are going well. Dealers here look for improvement in the fall, with a fairly good 1954, though behind 1953.

Midwest Business Mixed . . . Some used machinery dealers in the Midwestern states feel that last summer's business was at least one-third off from the same period in 1953, others haven't fared quite so poorly.

Although production machinery has fallen off, punch press business remains in better shape. This trend doesn't jibe with reports of slow business from local stamping plants.

Another reason, however, could be increased modernization demanding late model machinery.

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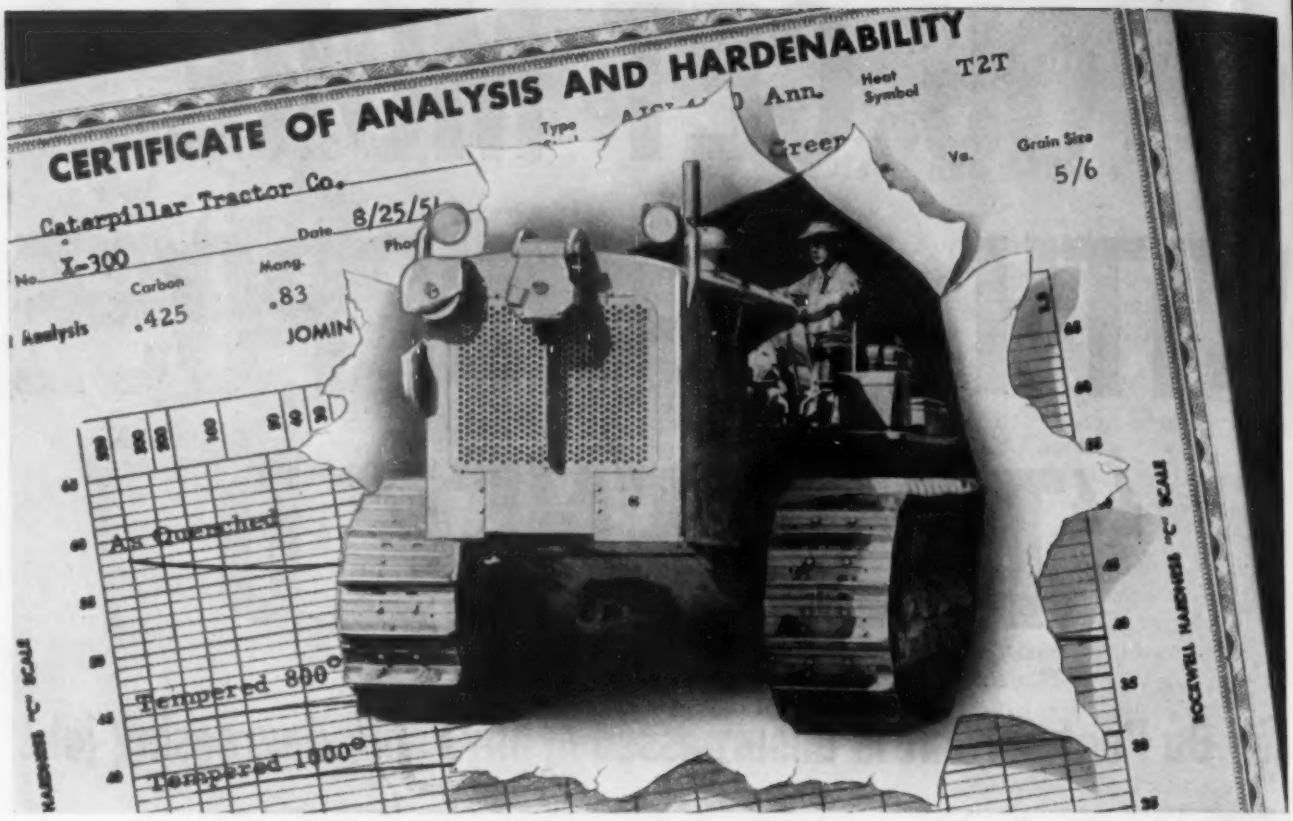

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It was 1935—Caterpillar pioneering in quality control—was concerned about the uniform quality of alloy steels from warehouse stock.

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Caterpillar pointed out that in the heat treatment of parts there can be as much difference in behavior between two mill heats of the *same* type composition as between two heats of *different* type composition. To emphasize this fact, they cited a statement in the AISI Manual that it would be false and misleading to assume all steels of a given composition are the same.

Ryerson accepted the challenge and began laying the groundwork for a quality control program which would include—1. selecting mill heats, 2. spark testing and carefully segregating every heat, 3. identifying each heat by heat symbol, 4. color marking for AISI number, 5. testing for hardenability in our own laboratory, 6. interpreting hardenability, 7. final inspection before shipment, 8. furnishing Certificate of analysis and guide to heat treatment.

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It just happens that Ryerson is one of four companies that have been serving Caterpillar since their founding—so we are particularly happy to tell this story of progress in quality control—inspired by Caterpillar on this, their 50th anniversary of service to America and to the world.

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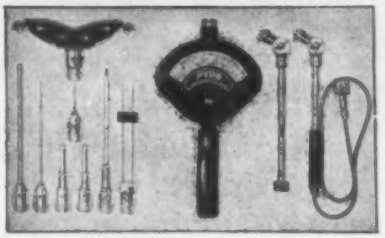

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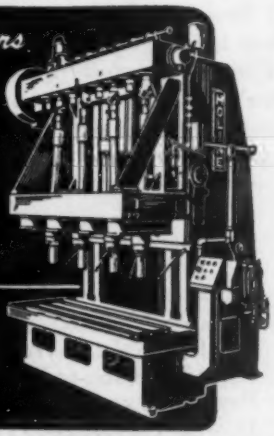

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President
Northern Pacific Railway Company

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Lagemann Model P-22 Scrap Metal Baler Box 15" x 18" x 40". Bale Size 75 lb.
Lagemann Model T-PH Scrap Metal Baler Box 60" x 16¾" x 18". Bale Size 60-90 lbs.
BENDER & STRAIGHTENER
Elmers Hydraulic Beam Bender & Straightener. Capacity 18" "I" Beams, Late Model
BENDING ROLLS
8' x ⅜" Bertsch Initial Type Bending Roll
18' x ⅜" Hilles & Jones Pyramid Type Bending Roll
10' x ½" Bertsch Initial Type Bending Roll
10' x ½" Hilles & Jones Pyramid Type Bending Roll
10' x 1" Hilles & Jones Pyramid Type Bending Roll
BRAKES—LEAF TYPE
6' x ¼" Dreis & Krump Size 186
10' x ¼" Dreis & Krump Size #206
10' x ⅜" Dreis & Krump Size 209
12' x ¼" Dreis & Krump Size 228
18' x ⅜" K.C. Leaf Type Brake, Hydraulic
BRAKES—PRESS TYPE
6' x ¼" Verson Press Brake
6' x ⅜" Cincinnati Press Brake
13' x ¼" Cincinnati #120-13 Press Brake
15' x 3/16" Jedson Hydraulic Press Brake
CRANES—OVERHEAD ELECTRIC TRAVELING
3 ton P&H Trav-Lift — 19' Span 440/3/60 A.C.
3 ton Euclid — 33' Span 230 Volt D.C.
5 ton P&H Trav-Lift — 20' Span 220/440 A.C.
5 ton N-B-P — 66' Span 220/440 A.C.
7½ ton Floor Operated — 23' Span 220/3/60 A.C.
10 ton P & H — 40' Span 230 Volt D.C.
15 ton P & H — 97' Span 115 Volts D.C. With 230/440/3/60 Motor Generator
20 ton Toledo — 75' Span 550/3/60 A.C.
50 ton Niles — 60' Span 220/3/60
135 ton Cleveland — 64'6" Span 220 Volt D.C. With 2 Trolleys 62½ Ton & 10 Aux.
CUT OFF MACHINE
Taylor Wilcox Cut Off Machine, Capacity 2⅜" to 6¾" incl.
DRAW BENCHES
35,000 McKay Chain Draw Bench, 41' Length of Draw
100,000# Poole Draw Bench, Max. length bar 30' With draw up to 4½" max. round
120/140 ton United Roller Type Drawbench
FORGING MACHINES
1" Ajax with Air Clutch
1½", 2", 3", 4", 5", 7", Ajax
1", 2", 3", 5", Acme
7⅛" National—Air Clutch—NEW 1942
4", 5" National
FURNACES—MELTING
6 ton Swindell Arc Melting Furnace
10 ton Electric Furnace Co. Arc Melting Furnace
15 ton Pittsburgh Lectromelt Size "NT"
HAMMER—MISCELLANEOUS
2000 lb. Chambersburg Coco-Drop Hammer—Late
HAMMERS — BOARD DROP — STEAM DROP — STEAM FORGING—800 lb to 8,000 lb.
LEVELERS—ROLLER
16" Torrington Leveler, 5 Rolls 3¾" Dia.
72" Sutton Leveler, 23 Rolls 8¾" Dia.
80" McKay Leveler, 17 Rolls 5¼" Dia.
MULTI SLIDE MACHINE
#35 U. S. Multi-Slide Machine—Nearly New Max. Width of Stock 4¼" x .080" thick With Edgewise Stock Straightener
PLATE DUPLICATOR
Thomas Machine Mfg. Co. Plate Duplicator. Handles Plates 6' x 16', Punch Capacity 6" Hole through ¾" Plate
PRESSES—HYDRAULIC
500 ton Wood 4-Column, 24" Stroke, 72" x 96" Bet. Columns
1300 ton Birdsboro 4-Column, 20" Stroke 30" x 36" Between Columns
PRESS—STRAIGHT TYPE
No. B6½ x 72 Niagara Gap Type Press, 6" Stroke Bed Area 72" R to L x 32½" F to B
PRESS—TOGGLE
Stamco Double Toggle Press, Capacity 12' x 14 Ga. With Gutter Dies
PUNCH & SHEAR COMBINATION
#10 Kling Punch & Shear, 48" Throat, Motor Drive Capacity Punch 2" hole thru 1" material
ROLLS—FORMING
Yoder M-2 10 Stand Cold Roll Forming Machine Roll Shaft 2" Dia., Roll Space 12"
Model NR-6 Maplewood Roll Forming Machine with Hemming Rolls for forming 3/16" hemmed edge from 26 and 28 gauge material.
ROLLS—PLATE STRAIGHTENING
87" Niles, Seven Rolls 13" Diameter
ROLLING MILLS
7½" Steckel Four High Rolling Mill
8" x 12" Blake & Johnson Single Stand Two High
12" x 16" Waterbury Farrel Temper Mill
14" x 20" Garrison Single Stand Two High
16" x 20" Lewis 2-Stand 2-High Cold Rolling Mill
18" x 24" Waterbury Farrel Two Stand Two High
18" x 60" Three High Roughing Mill
SHEARS—GATE
No. 6 Hilles & Jones, Capacity 123" x ¾"
No. 6½ Hilles & Jones, Capacity 132" x 1"
12' x 1" Pacific Hydraulic Gate Shear
SHEARS—ANGLE
6" x 6" x ⅞" Hilles & Jones No. 2 Double Angle Shear
8" x 8" x 1⅛" Kling Double Angle Shear
SHEARS—ROTARY
3/16" Quickwork Rotary Shear, 36" Throat
¼" Quickwork Whiting No. 25A—With Circle Cutting Attachment
⅜" Quickwork Circle Shear 18" Throat, With Circle Cutting Attachment
½" Quickwork Whiting No. 40A
SHEARS—SQUARING
8' x ¼" Cincinnati No. 1808, Motor Dr.
10' x 3/16" Bertsch, 24" Gap, Motor Drive
10' x 3/16" Dreis & Krump, Motor Drive
10' x ¼" Cincinnati, Motor Driven
SLITTERS
12" Waterbury Farrel No. 1 Slitter
30" Torrington Heavy Duty Slitter, With Pay-Off and Take-Up Reels, Capacity 5 Cuts 11/64" Steel
38" Paxson Coil & Sheet Slitter
72" Yoder Sheet Slitter
SPLITTING & TRIMMING MACHINE
Torrington #1664 Splitting & Trimming Machine Max. Trimmed Width 70" x .320" Max. Thickness
SWAGING MACHINE
No. 7 Langelier Swager, Capacity Tubing 3½". Solid Cold 2¼". Solid Hot 3"
STRAIGHTENERS
No. O Medart Continuous Automatic Straightening Machine, Capacity ⅜" to 1¼" Dia. Bars any length, or up to 2" Tubing, Motor Driven
No. 4 Abramson Flat & Shape Straightener, Capacity 3½" x ⅝" Flats, 2" Square & Hex., etc.
TESTING MACHINES
60,000 lb. Southwark-Tate-Emery Universal Hydr.
100,000 lb. Tinius Olsen Universal 4-Screw
150,000 lb. Tinius Olsen Universal 3-Screw
200,000 lb. Riehle Bros. Universal
400,000 lb. Tinius Olsen Super L DeLux Universal
WIRE MACHINERY
12 HIC Vaughn Continuous Fine Wire Drawing Machine Capacity Start #33½ finish #34 or Start #14 and finish #20

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ENGINE LATHES

Gema "Copytor" Duplicating Attachment, m.d.
Model TR 59 Hardinge High Speed Production Lathe, m.d.
12"x6' Lodge & Shipley Geared Head, m,d., taper
12"x84" centers Lodge & Shipley Geared Head, m.d., taper
14"x61½" centers American Geared Head, m.d.
14"x30" centers Bradford Lathe, Timken
14"x6'American High Duty Geared Head, m.d., taper
14"x6' Hendey Geared Head, m.d., taper
14"x6' Lodge & Shipley Geared Head, m.d.
14"x6' Pratt & Whitney, cone
14"x6' LeBlond, cone
14"x6' LeBlond, Geared Head, s.p.d.
14"x6' bed Monarch, cone, motorized
14"x6' Sidney Geared Head, m.d.
14"x6' Springfield Geared Head, m.d., taper
14"x8' Sidney Geared Head, m.d.
14"x8' Prentice m.d., taper
16"x30" centers Monarch, m.d., taper
16"x6' bed Cisco Geared Head, m.d.
16"x6' Hendey Geared Head, m.d.
16"x6' Hendey Yoke Head, taper
16"x6' Lehmann Geared Head, m.d.
16"x6' Lodge & Shipley Selective Head, m.d.
16"x6' bed Monarch Geared Head, m.d.
16"x8' Monarch, cone, motorized
16"x12' bed LeBlond Geared Head, m.d., taper
16"x14' Monarch, m.d., taper
17"x6' LeBlond Geared Head, m.d.
18"x5' LeBlond Geared Head, m.d.
18"x6'6" bed Greaves-Klusman Geared Head, m.d.
18"x96" centers Sidney, m.d., Timken, late
18"x7' Hendey Geared Head, m.d., taper
18"x8' bed American Geared Head, m.d.
18"x8' Hendey Geared Head, m.d., taper
18"x8' Lodge & Shipley Geared Head, m.d.
18"x8' Whitcomb-Blaisdell Geared Head, s.p.d.
18"x8'6" bed Walcott, cone, motorized
18"x10'6" bed Boye & Emmes, cone, motorized
19"x4' centers LeBlond, H.D., m.d.
19"x6' bed LeBlond Geared Head, m.d., later type
19"x10' bed LeBlond Geared Head, m.d.
19"x16' bed LeBlond Geared Head, m.d.
20"x8' bed Cisco, cone, motorized
20"x8' bed Greaves-Klusman Geared Head, m.d. in leg
20"x8' bed Boye & Emmes, m.d.
20"x8' bed Lodge & Shipley Geared Head, m.d., taper, late type
20"x10' Sidney Geared Head, m.d.
20"—40"x9' bed Rahn-Larmon Gap Lathe, cone, motorized
20"x10'6" Boye & Emmes, cone, motorized
20"x10'6" bed Sidney "Tritrol" Geared Head, m.d., late
21"x8' bed LeBlond Geared Head, m.d., taper
23"x12' bed LeBlond, cone, motorized
24"x12' LeBlond Geared Head, m.d., taper
24"x12' bed Boye & Emmes, belt drive
24"x12' Bridgeford Geared Head, m.d., taper
24"x13' bed Lehmann Geared Head, m.d., taper
24"x16' bed Lodge & Shipley, cone, motorized
24" Raised to swing 32"x22' bed—16' centers New Haven, cone, taper
25"x10' bed LeBlond Geared Head, m.d., taper
30"x10' bed Betts-Bridgeford, m.d.
30"x12'6" bed Niles-Bement-Pond, variable speed, m.d., taper
30"x13'6" bed Niles-Bement-Pond, m.d.
30"x18' LeBlond Geared Head, m.d., 8'10" centers
30"x40' bed (33' centers) Betts-Bridgeford Heavy Duty Hollow Spindle "Oil Country" type, m.d.
36"x84" centers American "Super-Productive," m.d.
36"x16'6" bed Boye & Emmes Geared Head, m.d.
36"x18' Putnam, m.d.
38"x17' centers American Super-Productive Geared Head, m.d.
40" raised to 48½x108" centers LeBlond, m.d.
42" raised to swing 56"x20' bed Lodge & Shipley, m.d.
42"x14' bed American Geared Head, m.d.
42" Putnam raised to swing 56½x20' bed Geared Head, m.d., 11'8" centers
48"x33' centers Niles-Bement-Pond, m.d.
63"x7' centers I. H. Johnson, m.d.
72"x7' centers I. H. Johnson, m.d.

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ROLLING MILLS—STEEL WORKS EQUIPMENT

1—34" & 22" x 112" 3-HIGH PLATE MILL with front and back tilting tables, 1500 HP motor and gear set; also 84" 3-high jump mill on same drive, with tables.
1—34" & 22" x 100" 3-HIGH PLATE MILL with 3000 HP motor drive, vertical edger, two tilting tables.
1—24" BAR MILL, 3-high, 3 stands, including motor, speed reducer, traveling tilting tables and billet furnace.
1—4-HIGH COLD SHEET MILL, 3 stands.
1—20" x 30" COLD MILL, 2-high, complete with drive.
1—12" x 16" COLD STRIP MILL, 2-high, with pay-off and take-up reels, gear drive and motor.
1—10" x 16" 3 stand TANDEM COLD REDUCTION MILL with individual 100 HP motors, payoff and take-up reels, and extra rolls.
1—8" x 6" COLD MILL, 2-high, with edger.
2—PACK FURNACES for hot sheet mills, 62" x 60', double chamber.
1—1800 HP GEAR DRIVE, ratio 19 to 1.
1—1250 HP GEAR DRIVE, ratio 3.91 to 1.
1—44" ROLL LATHE, enclosed headstock, tailstock, plano rest, with 20 HP, 500/1500 RPM, 230 volts D.C. motor and control.
1—34" x 192" ROLL GRINDER with all necessary motors and controls.
1—BILLETEER for conditioning billets up to 12" x 12".
1—PICKLING MACHINE for sheets, plunger type.
1—STRAIGHTENER, Sutton #1, 5 rolls, capacity 1½" round.
1—200-TON CAPACITY LADLE CRANE, 55'5" span.
1—BILLET SHEAR, open side, capacity 3½" round.
1—GUILLOTINE SLAB SHEAR, capacity 54" x 2½".
1—AUTOMATIC SHEET MILL SHEAR UNIT, Streine, with two end cutting and two side cutting shears.
1—PLATE SHEAR, capacity 156" x 9/16".
1—REEL FOR STRIP, collapsible block 11" face x 17½" diam.
1—ROTATOR FOR FORGING INGOTS, capacity 5 tons, motor drive.
1—SHEAR KNIFE GRINDER, 14' bed length.
1—2000 HP MOTOR, 6600/3/60, 600 RPM.
1—1250 HP MOTOR, 350/790 RPM, 600 volts D.C.

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MOTORS & GENERATORS, etc.
1 YEAR GUARANTEE

Partial Listing Only!

SLIPRING MOTORS

HP	MAKE	TYPE	SPEED
600	Cr. Wh.	181A	514
2-500	G.E.	IM	450
2-450	G.E.	IEM-17B	900
400	G.E.	IM	600
350	Westg.	C.W.	450
300	Westg.	C.W.	1200
250	G.E.	IM-17A	600
200	G.E.	MTP-557	1800
3-200	Westg.	HP-155	600
150	Westg.	HP-156	600
125	G.E.	1M-15	600
100	G.E.	MT-347	1200
100	G.E.	IM	720
100	E.D.		514

SQUIRREL CAGE MOTORS

HP	MAKE	TYPE	SPEED
300	Wagner	HP3-26Z	1800
250	G.E.	KF-6635	900
200	Al. Ch.		900
150	Westg.	GS	1200
150	Hl. Machy.		1200
150	Cr. Wh.	SC-85B	1800
150	G.E.	IK-17	600
125	Cr. Wh.	SC-82B	3600
125	Al. Ch.	AR-22M	1800
125	G.E.	IK	1200
100	Westg.	TEFC, CB-6078	3600
100	G.E.	KT-542	1800
100	Westg.	CB	1800
100	Westg.	CB	900

LOW & HIGH FREQUENCY A. C. GENERATORS

SIZE	MAKE	CYCLE
10 KW	G.E.	15
10 KW	G.E.	25/60
800 KW	G.E.	25/60
5 KW	G.E.	120
230 KVA	G.E.	150
154 KVA	G.E.	150
15 KW	G.E.	180
25 KW	Howell	180
50 KW	G.E.	210
5 KVA	Sterling	250
7½ KW	G.E.	120

DC MOTOR DRIVEN AC GENERATORS

50 KVA	Star	115		120
50 KVA	Westg.	230		220
81 KVA	Ideal	115		440
81 KVA	Hl. Machy.	230		440
13⅓ KVA	Cr. Wh.	230		240
10 KVA	Burke	110		120
7½ KVA	Hertner	115		230
5 KW	G.E.	230		240

SIZE	MAKE	INPUT VOLTS	OUTPUT VOLTS
5 KVA	El. Spec.	115	110
7½ KVA	Cont.	230	120
2¼ KVA	K & R	115	220

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SLIP RING MOTORS
Constant Duty—3 phase 60 cycle

Qu.	HP	Make	Type	Volts	RPM
1	1500	G.E.	MT-498	2300	257
1	1200	G.E.	MT-24	4160/2300	300
1	1200	G.E.	MT-24	2300	277
1	700	G.E.	I-M	2300	400
1	500	Al.-Ch.	ANY	2300	514
2	500	G.E.	I-16-M	2300	450
2	400	G.E.	MT-412	2300	450
1	300	G.E.	I-17A-M	2300	600
1	250	Whse.	CW-987	440	1200
1	250	Al.-Ch.	ANY	440	720
1	250	G.E.	MT-414	2300	300
1	200	G.E.	I-17A-M	2300	450
1	150	Al.-Ch.	ANY	440	720
1	125	G.E.	MT-557	2300	1200
2	100	G.E.	I-18A-M	2300	485

SQUIRREL CAGE MOTORS
3 phase 60 cycle

Qu.	HP	Make	Type	Volts	RPM
1	400	G.E.	I-K	2300	514
1	300	Whse.	CB-890	2300	1750
1	200	Whse.	CB-873-C	2300	1160
1	200	Al.-Ch.	AR	440	585
2	125	Al.-Ch.	AR	2300	1750
1	125	Al.-Ch.	AR	2300	490
1	100	Whse.	CB-863	440	1750
1	100	G.E.	KT-563	440	570
1	100	Whse.	CB-938	2300	495
1	75	Al.-Ch.	AR	2300	690

SYNCHRONOUS MOTORS
3 phase 60 cycle

Qu.	HP	Make	PF	Volts	RPM
1	3000	Whse.	80	4800/2400	720
2	2100	G.E.	100	2300	300
2	2000	G.E.	80	2300	720
2	1750	G.E.	100	2300	3600
1	750	G.E.	80	2300	450
1	710	G.E.	80	2300/440	720
1	500	Hl. Machy.	80	440	1200
1	350	G.E.	80	440/220	900
1	250	G.E.	100	2300	514
1	250	Whse.	80	440	600
2	200	Whse.	80	440	1200
1	187	G.E.	80	440	720
1	150	G.E.	100	2300	900
1	150	G.E.	100	550	600
2	125	G.E.	80	4000/2200	1200
2	125	Hl. Machy.	100	4800/2400	900
2	100	Whse.	80	440	1800
2	100	G.E.	80	440	600

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IMMEDIATE DELIVERY

FERRACUTE SD-703 Double Action Toggle Draw Press 700 Ton Cap., Bed Area 60" F.B. x 72" L.R., Stroke of Plunger 40", Stroke of Blankholder 20", 100 H.P. Motor.
BLISS No. 88 Straight Side Single Crank Press, Capacity 255 tons, Bed Area 30" & 29", 18" Stroke of Slide, Marquette Air Cushion.
TOLEDO Double Cranks, Nos. 91-42, 92C, 93½E.
CLEVELAND Double Cranks, 65-G-72, 45-D-60.
NIAGARA Double Cranks, 67C, 69BX, 612C.
BLISS Nos. 4, 22K, and 24K Knuckle Joint Presses.

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#61A Fellows Gear Shaper—Serial #21252.
Late type 12" x 48" Landis Type C Universal Hydraulic Cylindrical Grinder Serial #17690.
72" Niles Bement Pond Vertical Boring and Turning Mill—Reconditioned.
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#72A3—Heald Sizematic Internal Grinder — Serial #12278—Reconditioned and guaranteed.
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7A Jones & Lamson Turret Lathe Serial #8848.
(2) Greenfield #28 Hydraulic Internal Grinder — Serials #1-11-11902 and F4-11285.
#36 Van Norman Miller.
#47 Heald Single End Borematic—Serial #4868.
DB2112-A Excello Single End Borematic — Serial #10180.
42" Bullard Vertical Turret Lathe. Serial #14881.
Floor plate 14' x 15' with 8' power driven rotary table.
1—⅞" Consomatic & Tooling.
8" Bar Floor Type Niles Horizontal Boring Mill with Floor Plate. Serial #17755.
100" Niles Bement Pond Heavy Duty Vertical Boring and Turning Mill—Serial #17294.
24" Bullard Vertical Boring Mill—Spiral Brin. Serial #15000.
8" x 8" x 1½" Kling Angle Shear Serial #1277.

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Capacity 0.012" to 0.125" by 22".
Voss United chain type leveller.
92 rolls 1-3/16" dia by 24" face.
3 HP 220/440/3/60. Variable speeds.

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Natco Nos. C12 & G5 Multi-Drills.
Fellows No. 8M Red Liner Gear Checker.
Ingersoll 36" x 36" x 12' Adj. Pl. Mill.
P & W 30" Vert. 2-spin Profiler.

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8" x 8" x 1" ANGLE SHEAR
L. & A. Model C. Double Clutch. 15 H.P. motor. Excellent condition guaranteed. Low price.

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RE-NU-BILT
GUARANTEED
ELECTRIC POWER EQUIPMENT

D. C. MOTORS

Qu.	H.P.	Make	Type	Volts	RPM
1	2500	G.E.	MCF	600	400/500
1	2000	Whse.	Mill	600	250/400
1	1500	G.E.	MCF	600	750/950
1		Whse.	QM	250	140/170
1	900	Whse.		250	450/550
1	800	Whse.		200	95/190
1	825	Whse.		250	400/800
1	600	Al. Ch.		600	300/900
1	400	Whse.	CC-216	600	200/900
1	500	G.E.	MCF	600	200/900
1	450	Whse.		550	415
2	400	G.E.	MCF	550	300/1050
1	300/300	G.E.	MPC	230	300/930
1	250	G.E.	MPC	230	400/800
1	200	Rel.	1970T	220	720
1	200	Whse.	CB-5118	250	400/800
1	150	G.E.		600	250/750
1	150	Cr. Wh.	45H	230	1150
1	150	Cr. Wh.	45H-TEFC	230	890
1	150	Whse.	SK-151B	230	900/1800
1	150	Whse.	SK-201	230	300/950
1	50/120	G.E.	MCF	230	250/1000
2	100	Whse.	SK-151	230	450/1000
1	100	G.E.	CDP-115	230	1750

M-G Sets—3 Ph. 60 Cy.

Qu.	K.W.	Make	RPM	D.C. Volts	A.C. Volts
2	2000/2400	G.E.	450	250/300	2300/4600
2	1750/2100	G.E.	514	250/300	2300/4600
1	2000	G.E.	500	22cy 600	11000
2	2000	G.E.	514	600	6600/13200
1	1500	G.E.	720	600	6600/13200
1	1500	C.W.	514	30/115	4000/13000
2	1000	Whse.	900	600	4160
1	1000	G.E.	900	250	4600
1	1400 (3U)	G.E.	900	250	2200
1	750	Whse.	900	275	4160
1	750	C.W.	514	30/115	2300
1	600	G.E.	720	250	440/2300

TRANSFORMERS

Qu.	KVA	Make	Type	Ph.	Voltages
1	5000	Whse.	OISC	3	2300x26400
1	2500	Whse.	OISC	3	26400/13200x460
3	2000	G.E.	HVDDJ	1	66000x13800
1	1500	G.E.	HT	3	13200x2300
3	1000	G.E.	HVDDJ	1	2400x480
9	1000	Wagner	OISC	1	13200x460

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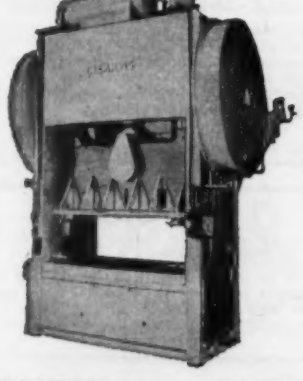

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ARCHITECTURAL GRILLES
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With the new addition, the University of Washington's stadium holds some 55,000 people. Mayari R was used for the seat brackets primarily for high tensile strength and corrosion-resistance.

Steel for 7,000 seat brackets had to be formable, weldable, corrosion-resistant

Everybody loves a football game, it seems, and so the University of Washington decided to enlarge its stadium by 15,000 seats. To support the new seats, 7,000 steel brackets were needed. They had to be strong, of course, and able to endure constant exposure to the atmosphere. They were to be formed from channels to the shape shown at right, and then welded into position.

These requirements led Century Metal Works, Seattle, who fabricated the brackets, to select Mayari R high-strength, low-alloy steel. Because it has 5 to 6 times the atmospheric corrosion-resistance of plain carbon steel, and nearly 50 pct greater tensile strength, designers knew that Mayari R would provide safe, long-lasting seat supports.

Century Metal Works found that they could cold-form Mayari R in practically the same way as plain carbon steel, without any special equipment. Welding the brackets in place posed no problems, either, since Mayari R welds as readily as any steel, and more readily than some.

These seat brackets illustrate how manufacturers and fabricators can take full advantage of Mayari R's superior qualities without having to adopt special shop techniques or equipment. The cold-forming, hot-forming, shearing, flame-cutting, punching, machining or welding of this versatile steel require little if any variation from normal procedures.

Our new Catalog 353 digs pretty thoroughly into Mayari R's properties and possibilities. You'll find this book worth having. You can get a copy through the Bethlehem office nearest you.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

BETHLEHEM STEEL

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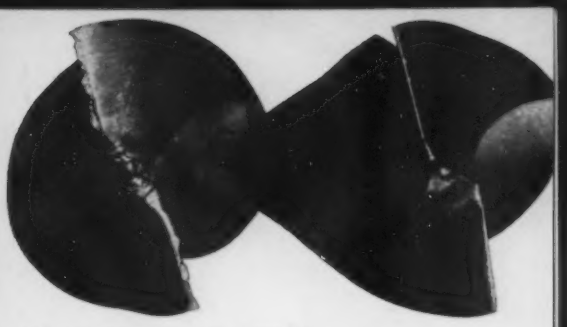
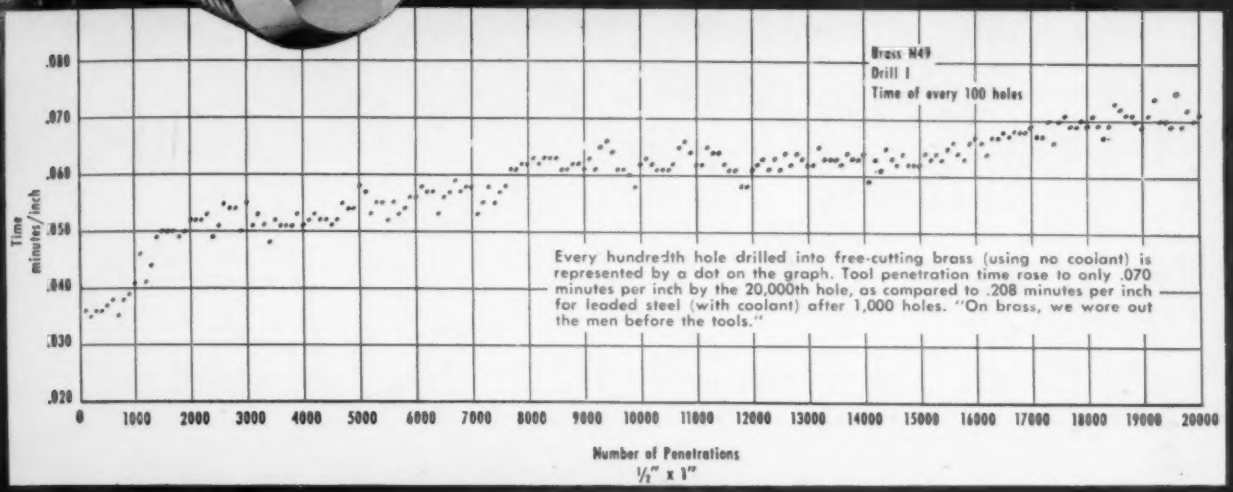
Mayari R *makes it lighter... stronger... longer lasting*



Left—condition of drill after 1,000 holes in leaded steel (with coolant); right—condition of drill after 20,000 holes in free-cutting brass (no coolant).



Every hundredth hole drilled into free-cutting brass (using no coolant) is represented by a dot on the graph. Tool penetration time rose to only .070 minutes per inch by the 20,000th hole, as compared to .208 minutes per inch for leaded steel (with coolant) after 1,000 holes. "On brass, we wore out the men before the tools."

exhaustive 20,000-hole drill test proves superior machinability of brass rod...

Titan

METAL MANUFACTURING COMPANY

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Is leaded steel as machinable as brass?

Lack of scientific machining data comparing these two metals prompted Titan to launch extensive research—not only in the laboratory but on the production line.

In a closely-controlled Constant Pressure Drilling Test using no coolant, the time to drill a ½"-diameter, 1"-deep hole in leaded steel increased 93.5% by the 200th hole. Penetration time for brass had increased only 6.45%. On this basis, brass was 14 times more machinable.

But Titan metallurgists went further. In an exhaustive effort to wear the drilling tool on brass to the same extent that 1,000 holes in leaded steel (with coolant) had worn it, a total of 20,000 holes were drilled in brass (using no coolant). Penetration time was only .070 minutes per inch for brass *after 20,000* holes as compared to .208 minutes per inch for leaded steel *after 1,000 holes.*

It was impossible to wear out the tool drilling 20,000 holes in brass. The test was stopped. "We wore out the men instead."

Read about Titan automatic screw machine production results comparing brass and leaded steel booster bodies. Send for free 48-page booklet titled "First Report." Use coupon below:

Dept. B

Titan Metal Mfg. Co., Bellefonte, Pa.

Gentlemen: Please send free booklet titled "First Report" about brass machinability.

Name_____

Title_____

Company_____

Street_____

City & State_____

for the exclusive fabrication of stainless and alloy steel products

The new plant shown above, now finished and in operation, permits us to fabricate stainless and alloy steels in a shop completely segregated from our carbon steel operations.

Purity is Paramount—From an experience of many years in making *both* carbon and alloy equipment for industry, it has been demonstrated that the ideal set-up is—*segregation.* For top quality it is better that high-grade alloy steels be not exposed to contamination by tools and equipment used to make ordinary carbon steel products.

Sun Ship's new Alloy Products Shop, therefore, marks a distinct step forward in a great and growing field. Chemical plants, oil refineries, atomic energy plants, and many other types of industry are finding more and more uses for equipment boasting the special strengths and virtues contributed only by alloy steels.

Every Size and Type—In this new shop we are working with all of the 300 or 400 series of alloys, clad steels and aluminum; and are fabricating such products as pressure vessels, tanks, towers, troughs, autoclaves, reactors, hoppers, kettles, platework and machinery. All sizes and types are handled; and pieces too long for delivery by rail can be shipped direct by water from our own docks on the Delaware.

Every Facility—The new shop is an integral part of Sun Ship's huge plant at Chester, Pa.—an impressive blend of steel fabricating shops, forge shops, boiler and tank shops, machine shops and every other facility needed for building the many types of made-to-order equipment required for modern industry.

For more specific information about our new Alloy Products Shop, for estimate, advice or a representative's personal call, just get in touch with our Sales Engineering Department. Your inquiry will receive prompt and expert attention.

Sun

SHIPBUILDING & DRY DOCK COMPANY

ON THE DELAWARE SINCE 1916 **CHESTER, PA.**

25 BROADWAY • NEW YORK CITY

Roebling drum packs are shipped on pallets unless otherwise specified. This gives you today's easiest, least expensive method of moving and stacking wire —with a fork truck, one man can do the work of ten.

Packed to save you money!

IN ADDITION to producing top quality high carbon wire, Roebling has developed many special methods of packing ...and some *one* of these, or some other method which may be developed for your specific requirements, may save a considerable amount of time and money in your plant.

Certain types of wire, for instance, can be packed in hexagonal fibre drum packs that provide superior protection and facilitate handling and storing wire. Drum packs do not have to be returned... save you bother, storage space and freight charges.

You *pay* for the best when you buy high carbon wire. Make sure you *get* the best, in wire and packing too. Always specify Roebling. John A. Roebling's Sons Corporation, Trenton 2, N. J.

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

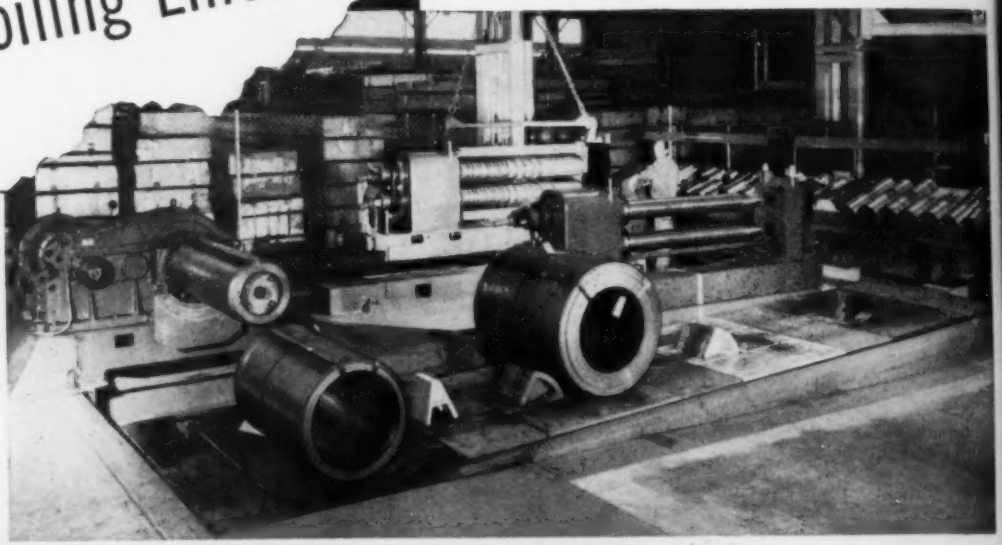
ATLANTA, 934 AVON AVE • BOSTON, 51 SLEEPER ST & 5 PITTSBURGH ST • CHICAGO, 5525 W. ROOSEVELT RD • CINCINNATI, 3253 FREDONIA AVE • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST • DETROIT, 915 FISHER BLDG • HOUSTON, 6216 NAVIGATION BLVD • LOS ANGELES, 5340 E. HARBOR ST • NEW YORK, 19 RECTOR ST • ODESSA, TEXAS, 1920 E. 2ND ST • PHILADELPHIA, 230 VINE ST • ROCHESTER, 1 FLINT ST • SAN FRANCISCO, 1740 17TH ST • SEATTLE, 900 1ST AVE S. • ST. LOUIS, 3001 DELMAR BLVD • TULSA, 321 N. CHEYENNE ST • EXPORT SALES OFFICE, TRENTON 2, N. J.

If you wish, Roebling spools will be delivered on pallets with separators, providing the easiest and most economical means of handling and stacking wire with fork trucks.

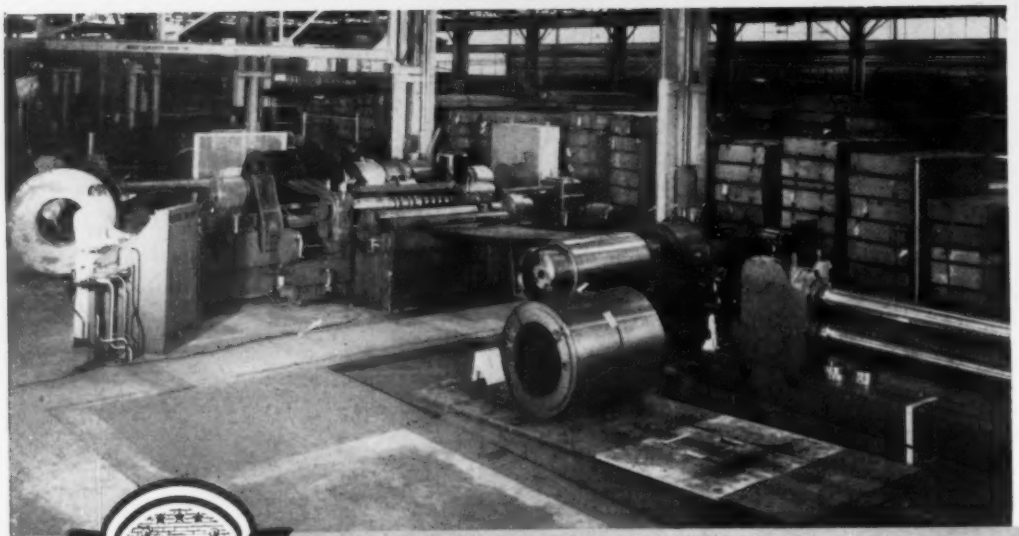
Step Up Production with Stamco Slitting and Coiling Lines

Stamco Slitting and Coiling Lines will step up your production because they are designed to meet your particular specifications. Years of experience have led to the development of equipment that will meet every slitting and coiling requirement. Stamco slitting and coiling lines are now efficiently handling coils from 500 to 60,000 pounds and are designed to give dependable, maintenance-free service.

Write us, stating your requirements . . . we'll gladly give complete details — no obligation.



View shows coil lift and traverse, coil pay off reel, coil loading ramp and detachable slitter head.



Overall view of coiling line from entrance end.

LAY YOUR SHEARING PROBLEMS AT STAMCO'S DOOR

STAMCO, Inc., New Bremen, Ohio

MORGANIZATION...maintains production

The reputation for doing its part to maintain plant schedules is built into every Morgan machine . . . cranes, rolling mill, or forging equipment.

Morganization now includes a complete survey of your Morgan equipment by experienced Morgan men. The condition of all parts is checked and reported to your maintenance department. Genuine Morgan parts will help maintain the designed efficiency of the equipment. If improvements should be made to increase this efficiency, our engineers will suggest how to make them at lowest cost.

This is another segment of "Morganization" . . . designing, building, servicing that makes Morgan Engineering machinery best. Write us for information on Morgan Maintenance Surveys for *your* equipment.

MORGAN ENGINEERING

THE MORGAN ENGINEERING COMPANY, ALLIANCE, OHIO

4500 per hour per machine!

You can't beat Revere Free-Cutting Brass for speed

The mounting nuts shown here are made by the Fischer Special Mfg. Co., Cincinnati 6, Ohio, out of Revere 9/16" hexagon Free-Cutting Brass Rod. Output is 4500 per hour per machine. This phenomenal rate of production is due to special adaptations of standard machines according to Fischer designs and the high quality of Revere Rod. These two important factors enable Fischer to compete price-wise with nuts produced by other methods.

Fischer nuts are chamfered and countersunk on both sides, have no burrs, and are made in sizes from 1/8" to 1-1/16", in various designs, such as hexagon, cap, thumb, spark plug terminal, lighting fixture. As a further indication of the efficiency of the Fischer operation it can be reported that during 1953 the company averaged 244,897 pieces per running hour.

If you machine brass, look into the virtues of Revere Free-Cutting Brass. See the nearest Revere Sales Office.

FISCHER WAFER or mounting nuts, made from Revere 9/16" Free-Cutting Brass Rod at a rate of 4500 per hour.

Revere Free-Cutting Brass Rod has speeded production for many firms, and saved them money.

REVERE

COPPER AND BRASS INCORPORATED

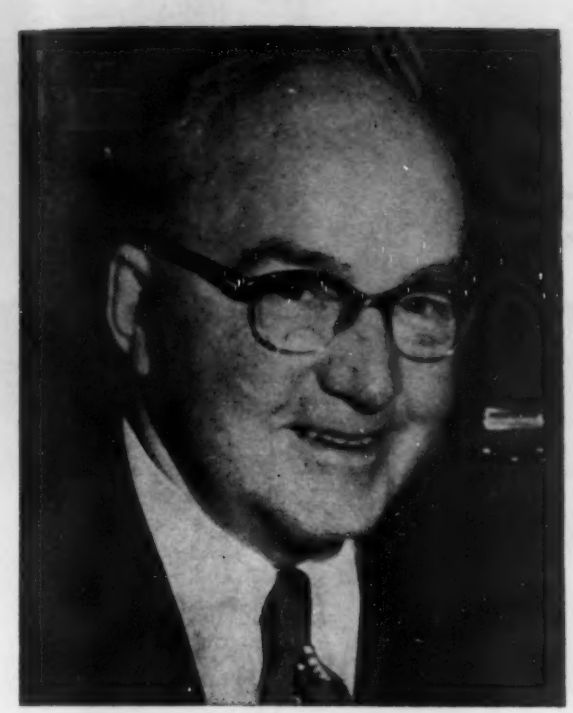
Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere

SEE "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS



The Iron Age

SALUTES

Thomas W. Pangborn **An outstanding business leader . . . he founded his own firm in a pioneer industry, has guided its growth and prosperity for half a century . . . his avocation, the welfare of his fellow men.**

Less than 1 pct of America's business enterprises continue under the same management and ownership for half a century. In those that do, and grow and prosper as well, we have learned to expect exceptional qualities of leadership.

Tom Pangborn, president of the Pangborn Corp., Hagerstown, Md., serves as an outstanding example of the rare combination of creative imagination, executive talent, perseverance and boundless energy needed to build and guide a successful industrial enterprise for 50 years.

In 1904, while employed as a salesman for Belleville Copper Rolling Mills, Tom began the development of his first sand blast machine. Shortly after that, Tom's brother, John, joined him. A small shop and office was rented in downtown New York and Pangborn Corp. was born.

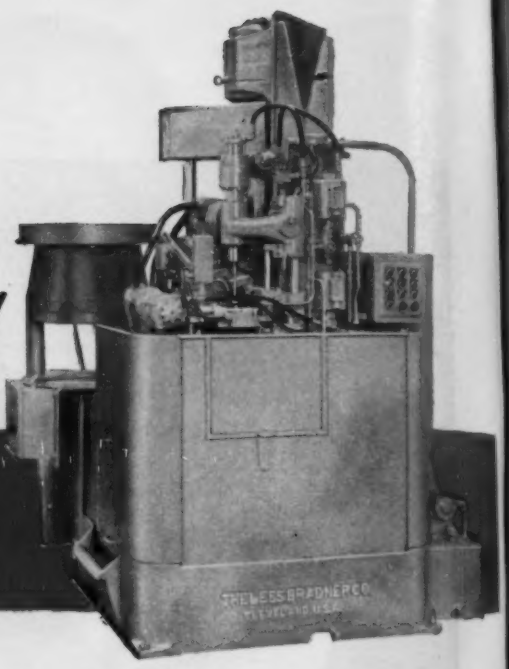
From this genuinely pioneer start Pangborn Corp.'s growth paced the development of the blast cleaning industry. Tom's missionary efforts had no little share in bringing acceptance of various applications of blast cleaning and dust control in manufacturing enterprises throughout the world.

One of the great pleasures of Tom Pangborn's life has been his wholehearted devotion to the welfare of his fellow men, in community, state or nation.

In 1945 Tom and his brother, established Pangborn Foundation to aid charitable, educational and religious causes. Among the many accomplishments of the Foundation have been a building for Washington County Hospital in Hagerstown, Pangborn Hall a dormitory at Mount St. Mary's College, substantial grants to American Cancer Society, Maryland Tuberculosis Assn., League for Crippled Children and scholarship aid for students at Hagerstown Junior College, the College of Notre Dame in Baltimore and the University of Notre Dame.

In recognition of Tom Pangborn's humanitarianism Pope Pius XII conferred upon him membership in the Knights of Malta, one of the oldest and highest honors for Catholic laymen.

Automation is here ...from blank to gear!



MODEL 7-A "AUTOMATIC" SINGLE-SPINDLE HOBBER

3" diameter, single-start hob
Runs at 350 R.P.M.
Feeds at .050" per revolution
Hobs two pieces per load
Hobs one gear every 45 seconds
16 teeth in gear
Face width of gear: ⅜"
Loading and unloading time: 2 seconds

The famous Lees-Bradner 7-A single spindle hobber has now gone completely automatic!

From blank to finished gear the whole operation is "push-button". Here's how it works:

Blanks are fed from a Syntron Vibratory Feeder down a rack to an automatic pick-up arm or loader.

The loader picks up two blanks at a time and moves them to the hobbing position under an expanding mandrel. The mandrel holds the blanks while the hob moves forward automatically to commence the hobbing operation.

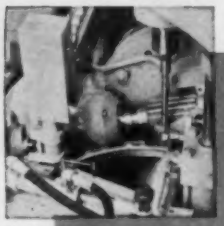
After the gears have been hobbed they are ejected by the loader as it sets the next two blanks in hobbing position.

As a control measure, the machine will not operate if:

- **The blanks are not in the loader**
- **The blanks are not removed from the arbor**
- **There is not sufficient hydraulic clamping pressure**

In the operation pictured the machine is hobbing a pinion gear for an automatic transmission.

Write to the company for details on this amazing new automatic hobber.



1. Arbor retracted ready for loading.

2. Loader arm moves to right with 2 blanks.

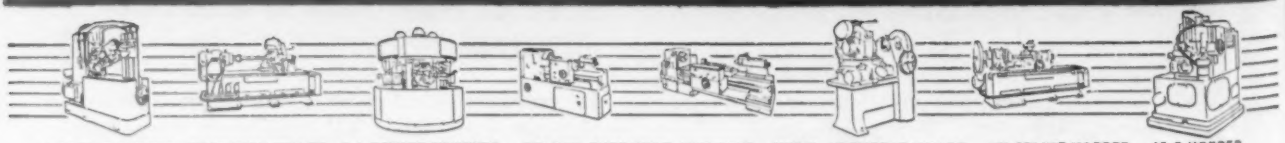
3. Loader about to eject finished gear from under mandrel.

4. Blanks held in place by mandrel ready for hobbing operation.

The Lees-Bradner 7-A Automatic Hobber is available in single units or quadruple mountings. (4 machines in line with common base, coolant tank, master control and feeder.)

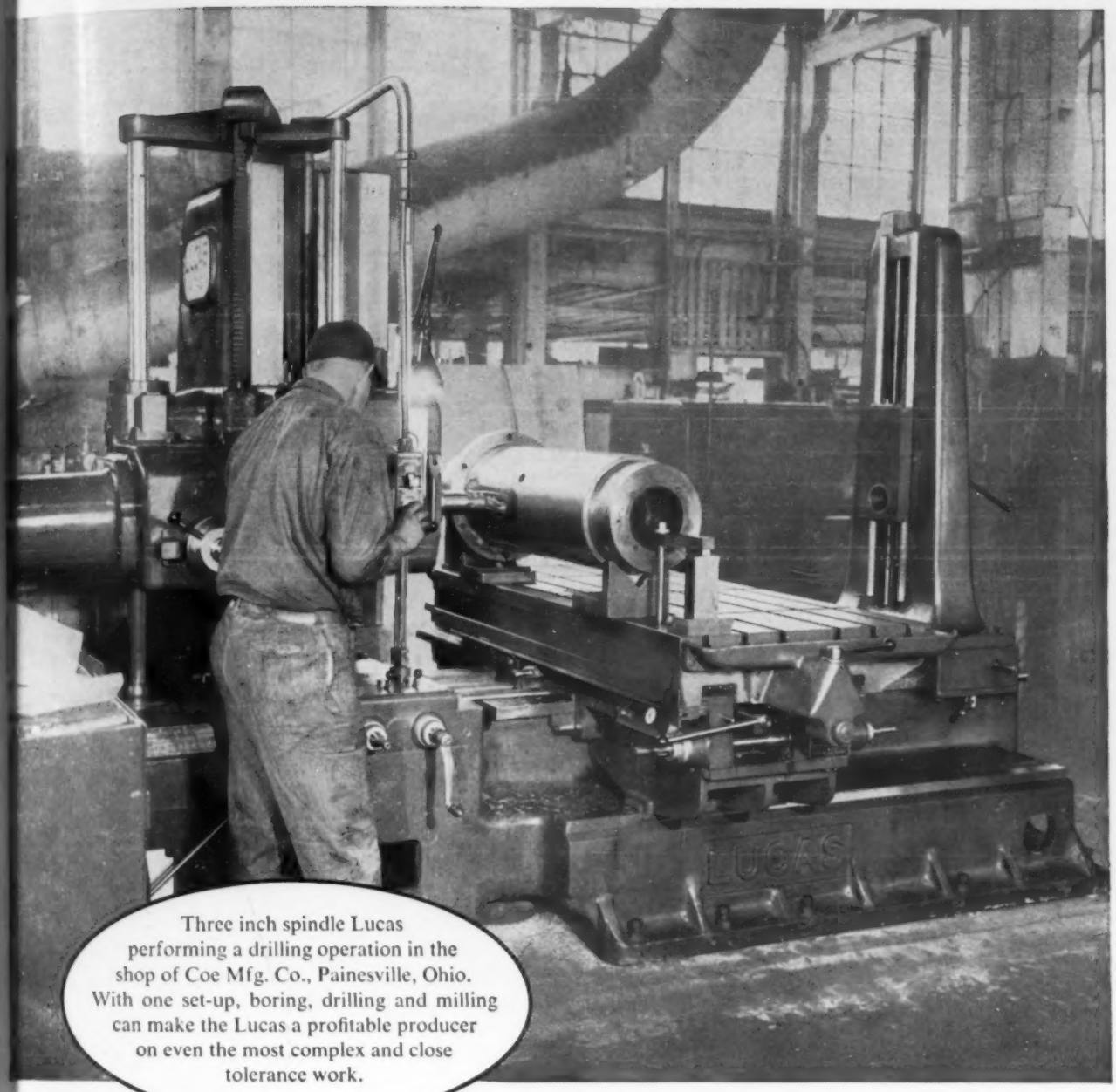
the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.



MODEL R HOBBER · HT THREAD MILLER · 7-A ROTARY HOBBERS · CRI-DAN THREADING MACHINES · MODEL 40 THREAD MILLER · SH SPLINE HOBBER · 12-S HOBBER

IF YOU THREAD OR HOB . . . GET A BETTER JOB WITH A LEES-BRADNER



Three inch spindle Lucas performing a drilling operation in the shop of Coe Mfg. Co., Painesville, Ohio. With one set-up, boring, drilling and milling can make the Lucas a profitable producer on even the most complex and close tolerance work.

If you operate a contract shop, JUST ONE LUCAS will enable you to out-bid competition on a wide variety of work.

It will prove to be your most versatile and PROFITABLE machine — on one piece or a thousand — because it can perform a wider variety of operations than is possible on any other machine in your shop.

On many contracts your new Lucas will cut a big slice out of your COST DOLLAR and add substantially to your PROFIT DOLLAR.

A moderate investment will put this smaller size 3″ spindle, table type Horizontal Boring Machine to work making money for you.

Write for the NEW Lucas catalog — just off the press.

LUCAS MACHINE DIVISION

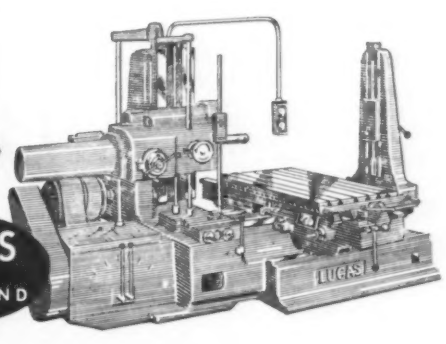
THE NEW BRITAIN MACHINE COMPANY • CLEVELAND 8, OHIO

. . . Machines for Making Progress

Three, four, five and six inch spindle

Lucas Horizontal Boring, Drilling and Milling Machines

Our general catalog is filed in the Sweet's Machine Tool Catalog File.



Your Problems Are Ours

NIAGARA FALLS, N. Y.

CHARLESTON, S. C.

CALVERT CITY, KY.

Pittsburgh Met works hand in hand with the steel industry t improve its present products and to develop new methods a alloys which are better suited to the industry's needs. An e perimental unit at Charleston is continually in operation in t research.

We realize the cost of alloys has a definite bearing upon t cost of producing steel and, for that reason, we employ a utilize the services of persons who have received their traini in the steel industry. By this method we have been unusua successful in effecting cost savings by the steel manufactur and also in developing and perfecting new alloys which do t job better.

The development and introduction of medium carbon fer chromium to the steel industry as a substitute for the more e pensive low carbon ferrochromium is a definite example t this cooperation.

Medium Carbon Ferrochromium

This is an alloy of chromium and iron containing 60-65% chr mium and 2.50-3.00% carbon. This medium grade of ferr chromium is well suited for use in the manufacture of stainle steels, permitting very large additions of chromium witho excessive carbon additions. This alloy is available in lump siz ranging from 4" up to 75 pounds and in crushed and scree sizes ranging from 4" to 20 mesh.

Other Cost-Reducing Alloys

High Carbon Ferrochrome
Low Carbon Ferrochrome Silicon
80-90% and 90-95% Ferrosilicon
65% Ferrosilicon Low Impurity Grade
50% Ferrosilicon
Electric Furnace High Silicon Pig Iron

Manufactured at Niagara Falls, Charleston and Calvert Cit plants, strategically located to serve you promptly via rail an water transportation and also by motor freight.

Pittsburgh Metallurgical Company, Inc.

SALES OFFICES

NIAGARA FALLS CHICAGO CLEVELAND DETROIT PITTSBU